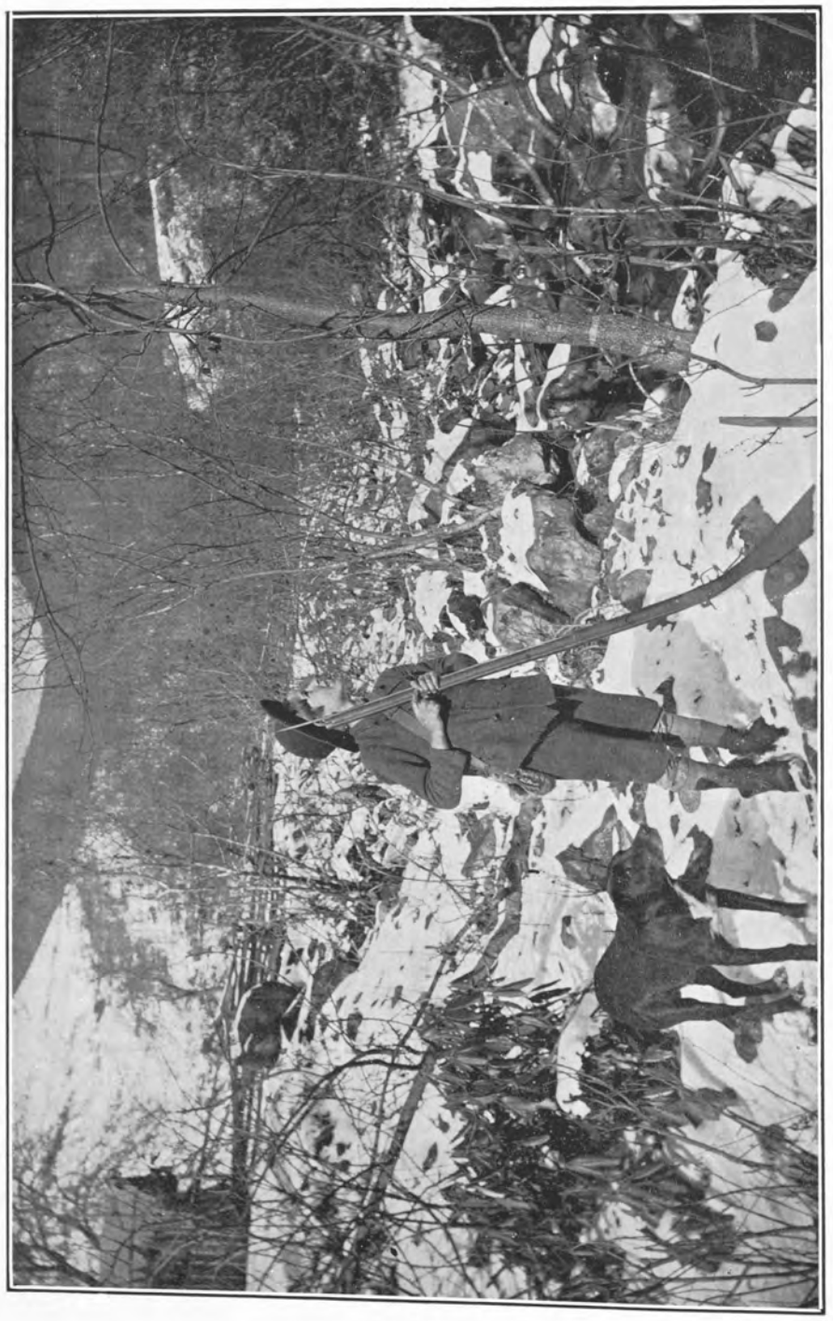

Head of Razor Fork.

Kentucky Geological Survey

CHARLES J. NORWOOD, Director

BULLETIN No. 11.

REPORT ON THE COALS

OF THE

Three Forks of the Kentucky River,

Beginning at Troublesome Creek on North Fork; at Beginning Branch on Middle Fork; at Sexton Creek on South Fork; and Extending to the Heads of the Respective Forks.

By JAMES M. HODGE.

OFFICE OF THE SURVEY: LEXINGTON, KY.

1910.

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LETTER OF TRANSMITTAL.

To His Excellency, AUGUSTUS E. WILLSON,

Governor of Kentucky.

Sir: This report on the coals of the region drained by the Three Forks of the Kentucky River was, as is indicated by the author's letter of submittal, ready for publication near the close of 1907. It has been in the hands of the printer somewhat more than two and a half years. As you are aware, the writer is not responsible for the long delay in putting it through the press.

Very respectfully,

C. J. NORWOOD,

Director, State Geological Survey.

Lexington, Ky.,

November 28, 1910.

LETTER OF SUBMITTAL.

PROF. CHARLES J. NORWOOD,

Director, Kentucky Geological Survey.

DEAR SIR:—According to your instructions, I have made a somewhat hasty exploration of the greater part of the drainage area of the three forks of the Kentucky river, with a view to revision of my reports thereon of 1885 and 1886.

In the course of that work it was found that for greater convenience of reference a new arrangement was desirable, and, in consequence, the accompanying entirely new report has been written, in which is collected, and presented in geographical sequence, all available geological information of the territory meriting notice.

Respectfully,

JAMES M. HODGE.

November, 1907.

REPORT ON THE COALS

OF THE

THREE FORKS OF KENTUCKY RIVER.

The title to this report includes somewhat more territory than is covered by it, the lower portions of each Fork having been, of necessity, omitted. The area covered is, on the North Fork, its drainage from the mouth of Troublesome creek, including that of the latter stream; the Middle Fork drainage through Breathitt, Perry and Leslie counties; the South Fork from the Owsley-Clay county line to its heads.

Following a general review of the various coal beds are given details of openings and localities, with running comments upon them. The geographical arrangement there adopted gives opportunity for reference in one place to all the coals of each locality, so far as they have become known to the writer. It should be borne in mind that many openings were not visited for want of time for it, and far more because of their having fallen in.

The accompanying map gives, in blue figures, tide-water elevations of some of the principal points of the region, and, in underscored black figures the sea level elevation of the Fire-clay coal bed, wherever found with its characteristic flint clay or "jack-rock" parting. These latter elevations and others in the text were obtained, usually, by barometric measurement of the height of the opening from the adjacent main stream, to which was added the height of that stream as determined from the topographical maps of the U. S. Geological Survey. Two

sources of error are, therefore, involved, which, doubtless, have led to considerable variation from the true heights, but the general results show an unexpected conformity, and are of much assistance in correlations.

The numbering of coal beds, heretofore adopted with advantage, is now discarded in favor of names for them. Few of the beds are continuous in thickness and in character throughout the eastern part of the State; and local names are more easily adopted into general use.

The topography of the region varies but little in its whole extent, being a succession of narrow winding valleys, inclosed by steep ridges with sharp summits. Width of valley is in general roughly proportional to the size of its stream, and the rate of its fall inversely proportional to it. When the Lower Conglomerate measures appear above drainage, as on the North Fork from Whitesburg to Thornton creek, and on the South Fork from Bullskin creek to Collins Fork, a soft shale at the top of those measures has caused a more rapid wearing and widening of the valleys. Shales on the Middle Fork in the vicinity of Crockettsville have had a like effect.

The top of the Conglomerate formation rises to a height of 40 feet in sandstone cliffs with 50 feet of softer sandstone on them at Whitesburg, and at Manchester to a height of 100 feet.

Of other sandstones, that one close under the Fire-clay coal is most worthy of remark, though perhaps not the most conspicuous. It is most apt to form cliffs or narrow ravines where it lies near drainage level, and the streams have recently cut through it. This is especially noticeable on Lost creek below Ten Mile creek, and on the North Fork at Squabble creek. At these points the extreme crookedness of the streams is attributed to a cross-roll of strata running about with the county line southwestward from Lost creek; which

may also have been influential in causing the near approach of the two forks a few miles further south.

The cliffs appear on Cutshin creek, and on the Middle Fork drainage above Hyden for a long distance, and seem to have deterred farming along those streams to a considerable degree.

On the eastern branches of Red Bird above Big creek the place of the Fire-clay coal can often be approximately located by the opening of the ravines and reduced rate of fall of the streams on top of the sandstone, which seems to be particularly hard here.

Loose pebbles have been found on this horizon at several points along the North Fork, as detailed later, oftener above the coal, and, according to one statement, they have been found incorporated in the sandstone over the coal, but verification is yet needed that conglomeratic rocks are to be found near this horizon; their occurrence as such is certainly rare.

The most prominent sandstone above the Lower Conglomerate lies directly over the Haddix coal, in Breathitt county, about 200 feet above the Fire-clay coal. Its cliff-making tendency is seen at almost every opening of the coal under it, yet it can seldom be identified without help from the neighboring coals, for other sandstones, especially higher ones, are of much the same character. Pebbles believed to have come from this rock were found on Clover fork of Leotherwood creek. (See page 118.)

About 500 feet above the Fire-clay coal over most of the region, and probably 700 feet in its extreme southern part, is a sandstone not especially conspicuous, of little area because of its height, which may become of much interest as the top of the Upper Conglomerate, prominent about the heads of the Cumberland river. The correlation is not fully established, and the only evidence yet obtained of its being conglomerate on Kentucky river waters is in a single pebble found lying

loose in the road from Hazard to Hyden, in the gap at the head of Mackintosh creek; but no especial attention has been paid to the rock.

Excepting the north face of Pine Mountain, strata lie in long, broad, undulating slopes of light pitch, nowhere averaging over one per cent., other than in local rolls of minor importance. Arrows on the map show the direction of dip, as do also the Fire-clay coal elevations there given, covering the greater part of the region under review. Without too close reliance on the accuracy of the figures, they still impart much information.

From near the mouth of Troublesome creek, at the foot of the southeasterly downward slope from the border of the coal field in Wolfe county, a synclinal axis is found to lie along the North Fork southward through Breathitt into Perry county, and thence crossing into Leslie county, following the general direction of Cutshin creek up to its head; rising some 300 feet in that distance of 40 miles. The rise is not uniform but is confined mostly to its southern half, and there the rise appears to increase southward.

East of this axis there is an easterly and southeasterly rise, which brings the Lower Conglomerate to the surface along the North Fork between Sand Lick creek and Boone Fork. These and intermediate tributaries of the North Fork, on the north, have strata lying nearly level, but east and north of them the rise is continuous throughout the North Fork drainage area.

The foot-hills of Pine Mountain show strata somewhat distorted by the fault which came with its uplifting. The Coal Measures are cut off at the main base of the mountain by this fault.

West of the synclinal axis there is a southwest rise which extends through Kentucky Ridge to Pine Mountain, but on Goose creek from Manchester up to Asher fork of the main

stream and to Hammond's fork of Collins fork this dip is reversed.

The foregoing deductions disregard slight undulations of strata, which may sometimes give reversals of the general dip, especially likely to occur where the course of the stream is contrary to that dip. Every locality must eventually be worked out by itself, for which this general description may serve as a guide; and this may be modified to some extent on gaining a more accurate knowledge of elevations.

The following general section gives the approximate relative position, in descending order, of the principal coal beds of the region, with names as adopted in this report, in part new and in part as locally known:

Hindman Coal Bed.

Interval, 100 to 150 feet in Knox county and northern Perry county.

Flag Coal Bed.

Interval, 40 to 80 feet in Breathitt and Knox counties, and in northern Perry county.

Hazard Coal Bed.

Interval, 80 to 100 feet, except in the extreme south and west.

Haddix Coal Bed.

Interval, 200 feet, except in the extreme south and west.

Fire-Clay or Hyden Coal Bed. (Formerly called No. 4.)

Interval, 30 to 60 feet.

Whitesburg Coal Bed.

Interval, 150 feet.

Elkhorn Coal Bed. (Formerly called No. 3.)

Interval, 200 feet in Southern Knox and Letcher counties.

Rockhouse or Manchester Coal Bed. (Formerly called No. 1.)

Interval, 200 feet at Beattyville.

Beattyville Coal Bed.

The interval between the Fire-clay coal and the Hindman bed, about 530 feet between Hindman and Hyden, is believed to increase to about 730 feet at the head of Middle fork.

Two other beds, at least, are known to be workable, one of them being between the Rockhouse and Elkhorn beds, the other a rider to the Fire-clay coal, sometimes rising to 60 feet above it.

Nine beds are known to carry cannel coal. They are: (1) A thin bed in Clay county, over the Manchester coal. (2) The Elkhorn bed in Letcher county. (3) The Whitesburg bed in Letcher county and on Middle Fork and Elisha's creek, Leslie county. (4) The Fire-clay coal at intervals over much of the region. (5) The rider to the Fire-clay coal at intervals over much of the region. (6) The Haddix coal in Breathitt and Perry counties. (7) The Hazard coal in southeastern Leslie county. (8) The Flag coal in Breathitt and into Perry county. (9) A rider to the Hindman bed on Big creek, Perry county. A cannel coal opening at the head of Red Bird in Bell county, not correlated, is either of the Hindman bed or of one close to it.

Splint coal in varying proportions is common to all the beds.

Analyses of coals are given under the headings of the respective localities from which they were taken, and in addition thereto some of those representative of the several beds are repeated in the following table.

In many instances, as noted, however, the samples for analysis were necessarily taken from outcrops, and therefore gave an excessive proportion of ash, with corresponding reduction of valuable constituents, for which due allowance should be made. Though the coals are generally variable in quality in each bed, it is believed that they will rarely fall below a fairly high standard of excellence.

The numbers in the first column of the table followed by the letter "r" refer to the numbers used in the Chemical Reports of the Survey; those followed by the letter "l", to the laboratory records.

TABLE OF ANALYSES

Labor'y No. (l) Rep. No. (r)	Name of Bed	Location.	County	Total Coal Inches
2703*l*	Beattyville	Sturgeon Cr.	Lee	47
2704*l*	Beattyville	Sturgeon Cr.	Lee	34
2357*r*	Rockhouse	Rockhouse Cr.	Letcher	44
2358*r*	Rockhouse	Mouth of Sand Lick Cr.	Letcher	25‡
2359*r*	Rockhouse	Mouth of Sand Lick Cr.	Letcher	28†
2649*r*	Manchester	Goose Creek	Clay	39
2756*l*	Elkhorn	Mouth of Little Carr	Knott	46
2352*r*	Elkhorn	Laurel Br. North Fork	Letcher	96
2361*r*	Elkhorn	Same opening; Lower seam	Letcher	70
-------	Elkhorn	Potters Fork	Letcher	83
-------	Elkhorn	Same, 48-hr. Coke	Letcher	--------
-------	Elkhorn	Same, 72-hr. Coke	Letcher	--------
2528*r*	Fireclay Coal	Lost Cr.	Breathitt	24
2754*l*	Fireclay Coal	Rockhouse Cr.	Letcher	c. c. 18
2753*l*	Fireclay Coal	Millstone Cr.	Letcher	66
2737*r*	Fireclay Coal	Rockhouse Cr.	Leslie	69
2735*r*	Fireclay Coal	Greasy Cr.	Leslie	44
2647*r*	Fireclay Coal	Indian Grave Br.	Clay	51
2739*r*	Rider to Fireclay Coal	Beech Fork	Leslie	c. c. 38
2282*r*	Haddix	Mouth Troublesome Cr.	Breathitt	c. c.
2530*r*	Haddix	Russell Br.	Breathitt	58
2795*r*	Haddix	Mouth of Squabble Cr.	Perry	36
2735*l*	Hazard	Mouth of Dan Fork	Knott	58
2755*l*	Hazard	Hindman	Knott	42
2738*l*	Hazard*	Laurel Fk. Cutshin	Leslie	67
2737*l*	Hazard	Laurel Fk. Cutshin	Leslie	c. c. 23
2733*l*	Flag	15 Mile Cr.	Perry	86
2732*l*	Flag	16 Mile Cr.	Perry	58

‡Upper seam. †Lower seam. *Analysis of bituminous portion.

KENTUCKY RIVER COALS.

ANALYSIS.						
Specific Gravity.	Moisture.	Volatile Comb. Matter.	Fixed Carbon.	Ash.	Sulphur.	Character of Coke.
1.345	4.16	38.97	49.24	7.63	1.97	Spongy.
1.299	3.53	40.51	49.00	6.96	2.60	Spongy.
1.242	1.46	35.84	58.60	4.10	1.068	Light Spongy.
1.277	1.30	39.60	55.20	3.90	2.812	Light Spongy.
1.286	1.60	36.40	56.60	5.40	1,060	Light Spongy.
1.278	1.48	35.92	54.70	7.90	0.885	Spongy.
1.367	2.92	34.90	54.36	7.82	0.65	Friable.
1.291	3.26	32.24	61.60	2.90	0.656	Dense.
1.319	2.86	31.54	62.10	3.50	0.535	Dense.
--------	1.950	37.350	57.367	2.800	0.533	----------
--------	0.302	1.623	91.320	6.165	0.590	----------
--------	0.170	1.135	91.731	6.505	0.459	----------
1.366	1.40	35.90	52.50	10.20	3.483	Spongy.
1.309	0.39	46.11	40.50	13.00	2.00	Dense.
1.333	1.43	37.00	53.35	8.22	0.71	Spongy.
1.279	0.74	36.06	54.00	9.20	1.307	Spongy
1.251	1.72	35.02	57.60	5.66	0.599	Spongy.
1.288	1.10	35.60	56.90	6.40	0.885	Light Spongy.
--------	1.10	44.20	43.70	11.00	0.690	Dense.
1.212	1.60	46.60	46.80	5.00	0.824	Dense Spongy.
1.345	3.80	35.60	54.80	5.80	0.875	Dense.
1.257	1.90	37.10	57.90	3.10	0.749	Spongy.
1.294	1.76	41.98	49.67	6.59	1.83	Dense Spongy.
1.264	1.44	41.67	52.24	4.65	1.05	Spongy.
1.290	1.67	38.78	53.91	5.64	1.34	Dense Spongy.
1.225	1.56	46.94	45.16	6.34	0.72	Dense.
1.337	2.48	35.51	52.43	9.58	1.05	Dense Spongy.
1.297	2.09	38.61	54.21	5.09	0.83	Dense Spongy.

Beattyville Coal Bed.—This Inter-Conglomerate coal, the lowest of the series, is given its name because of its having been mined at Beattyville for nearly fifty years. It is now mined to a considerable extent at various other points in the vicinity, with generally 3 to 5 feet thickness of coal, but it sometimes runs below workable limit.

It sinks below drainage at St. Helens, at the junction of the North and Middle Forks, and farther up those streams its depth below them is governed not alone by the fall and dip of the strata, but probably also by an increase in the thickness of Conglomerate measures overlying the coal.

This would probably result in carrying the coal, within a few miles of those two Forks, to a depth prohibitive of mining for many years to come, for, though in the vicinity of Whitesburg the Conglomerate measures appear above the North Fork level, their thickness, as developed on Pine Mountain, is such as to carry the coal far below the surface.

On the South Fork the case differs. There the strata rise with the stream, and the Conglomerate measures probably increase to much less extent, so that there is a fair prospect of finding the bed of workable thickness at moderate depth as far up as and even beyond Manchester.

Similar coal of equal thickness in the Conglomerate of Pine and Stone mountains tends to the theory of a rather uniform deposit underlying most of the intervening region.

The coal is a bright, pitch-black block and splint coal, which, in spite of its carrying more sulphur than do the higher coals of the Three Forks, stands well in the market as a steam and domestic coal, after long use especially in Richmond and other towns of Central Kentucky.

Analyses of the coal are given below; Nos. 1865, 1866, 1867 by Dr. R. Peter from samples collected for the Survey by Prof. A. R. Crandall from the vicinity of Beattyville; Nos. 2703 and 2704 by A. M. Peter from my samples taken from Sturgeon creek.

BEATTYVILLE BED.	No. 1865	No. 1866	No. 1867	No. 2703	No. 2704.
Moisture	2.30	2.10	4.00	4.16	3.55
Volatile comb. matter	38.10	38.10	35.50	38.97	40.51
Fixed carbon	51.64	51.64	55.50	49.24	49.00
Ash	7.96	8.26	5.00	7.63	6.96
	100.00	100.00	100.00	100.00	100.00
Sulphur	2.356	3.991	1.041	1.97	2.60
Coke	L't. spongy	spongy	L't. spongy	spongy	spongy
Specific gravity	1.331	1.334	1.307	1.345	1.299
Color of ash	lilac gray	lilac gray	light lilac gray	brownish	purple

Rockhouse or Manchester Coal Bed.—This bed, numbered Coal 1 in former reports and known as the Sand Lick bed in the vicinity of Whitesburg, is here given the name of Rockhouse, because of its many good exposures along that stream in Letcher county. For Clay county the name of the town of Manchester is applied to the bed, its coal being the only source of supply in that vicinity.

The bed is the lowest of the Carboniferous formation, and is supposed to be some 200 feet above the Beattyville bed, where the latter goes below drainage at St. Helens. The former is below drainage throughout the region except in Letcher and Clay counties. In Letcher county the bed crops out near the base of the hills along Rockhouse creek from below Camp branch nearly to the head of the creek, about 4 feet of clean coal. It is exposed on the North Fork and branches, also low down, from Kings creek nearly to Thornton, but with more variable section, running from 2 to 5 feet of coal; but where thickest it is divided into two nearly equal parts, with the parting sometimes giving it the appearance of two distinct beds.

In Clay county the bed is in outcrop low down along the South Fork and up the Red Bird to Flat creek, where it goes

below drainage. At Manchester it is 100 feet high, and thence southward falls below drainage near the county line on the Right fork and on the Left fork above Otter creek. In this county it varies generally from 2 to 4 feet without parting, its best condition being found on Laurel and Horse creeks, where it closely approaches 4 feet of clean coal. It was formerly mined to considerable extent for use at the salt works along Goose creek, but with the abandonment of that industry the mines fell into disuse.

As in Northeastern Kentucky, the coal seems to be remarkably pure, and especially as regards sulphur. The quality of the coal is perhaps more uniform than in any other bed of the series. Analyses of it are given in the detailed section of this report under the headings of the streams from which samples were taken.

Between the Rockhouse and Elkhorn beds, 80 to 120 feet from either, is a workable bed not included in the preceding enumeration of beds, as it cannot yet be identified elsewhere than in a rather restricted area of Letcher county. On Colly and Thornton creeks and Boone fork it gives a nearly uniform section closely approaching 4 feet in thickness, without parting; corresponding with sections of the Rockhouse bed on Rockhouse creek. It appears, though, to be of poorer quality. On Colly it has a thin streak of cannel and an inconstant parting.

Elkhorn Coal Bed.—This bed, called No. 3 in a former report, lies near drainage level on the lower part of Troublesome creek, where it is thin or badly split up with partings. This seems to be the case in the vicinity of Hindman, where it appears to have risen above the creek, but it may possibly be still below.

It rises to Carr fork at the mouth of Breeding creek and has 3 1-2 to 4 feet of coal, injured by partings, at the mouth

of Little Carr. Further up Carr and on Rockhouse creek, rising somewhat faster than the stream-beds, it appears to run about the same thickness of coal without parting, the lower 6 inches to 12 inches frequently cannel coal.

The bed disappears below the main North Fork near the mouth of Troublesome creek and rises again near the mouth of Line fork with coal too thin to make identification positive. Thence it rises to some 150 feet above the mouth of Rockhouse creek and 350 feet above Whitesburg. Thence up the river it rises but slowly, being only 180 feet above the mouth of Potter's fork. On Colly and Thornton creeks the bed is reported of workable thickness, but only on crossing to the east of Boone fork does it appear with 8 feet of coal, which it carries through into Pike county.* This coal in Letcher county appears generally to be good, but only that of the thickest openings has been thoroughly tested for coke. The results have been so satisfactory as to leave no question of its availability for that purpose, and raise it to estimation as one of the most valuable beds of the State.

On the Middle Fork the bed probably rises to outcrop about at the mouth of Guy's creek and is opened to 4 feet nearly clean coal on Rush creek. Thence to Bull creek it lies unopened at or near river level, but two miles above Bull creek, at the Asher mines, it is 50 feet above the river, and with 4 1-2 feet of coal. For the next two miles, to Hyden, the bed shows but about 2 1-2 feet of coal and above Hyden still less.

At the Rush creek and Asher mines the coal is apparently of excellent quality, the main body of it being splint coal.

*For a description of this coal in Pike county, see Bulletin No. 4, Kentucky Geological Survey.

Elsewhere on the Middle Fork, where noted, it seems to be softer and more of the nature of coking coal.

On the South Fork waters the bed has not been found anywhere of workable thickness, though at the mouth of Asher fork, Goose creek, it is nearly so.

Whitesburg Coal Bed.—Like the Elkhorn, this bed is thin and not positively identified on Troublesome creek waters near its mouth, though its usual occurrence with black slate roof should make correlation comparatively easy. The bed soon goes delow drainage up Troublesome and Lost creeks, and appears only as thin coal when risen to surface near Hindman.

On the main North Fork it is also mostly below drainage up to Hazard, where it has been worked in an entry at road level at the upper end of the town, where its partings ruin the bed, and it is not known to be of workable thickness lower down stream than Rockhouse creek. At the head of Camp branch it has 4 feet of what appears to be excellent coal, but so high in the hills there that its area is not large. If of equal thickness farther down Rockhouse a deposit of much value remains to be found, and openings on the North Fork give favorable prospect for it.

On Smoot creek the bed has 1½ to 3 feet of cannel coal with a little soft coal on top of it, and across the ridge on Dry creek nearly 5 feet of soft coal, its best exhibit. Beyond this the bed is recognized only opposite Whitesburg, 500 feet above the river, where it has 3 to 3½ feet of coal, mainly splint. The high hill here gives it a considerable area.

On the Middle Fork it is conspicuous, but thin, along the road from Long to Guys creek, its black slate covering being especially noticeable.

But few openings into the bed are known to have been made above Guys creek, and they are thin, except two on the main stream near the mouth of Beech fork, where there is nearly 4 feet of clean coal within 60 feet of the river. The extent of this coal needs development, and in this connection the 32-inch coal, half cannel, of the same bed in Elisha's creek, should be noted, though the bed thins toward the head of that creek.

Excepting this opening on Elisha's creek, the bed is not known of workable thickness on South Fork waters.

Where of workable thickness, the coal appears to be of excellent quality, generally in large proportion splint coal. As cannel it is rare

Fire-Clay-Coal Bed.—This bed, previously called No. 4, may be given the name of Hyden to conform with the nomenclature now adopted, though, as it is quite generally known on the Three Forks as the Fire-clay coal bed, that name is preferred in this report. It is the "Dean" coal of the Cumberland river basin, and carries its characteristic flint-clay parting, rarely wanting, but sometimes forming the floor of the bed in the absence of the lower seam of coal. Occasionally a "jack-rock" takes the place of the pure flint clay.

Because of this usually unmistakable parting, the bed serves as a safe key to correlation throughout nearly the whole region, and far beyond its limits.

The general map accompanying this report gives in underscored black figures the elevation of the bed above tide, as deduced from the U. S. topographical maps. The more accurate height above drainage of each opening is given in the latter part of this report.

The bed is first recognized on North Fork waters just before going below drainage on Lost creek, with 2½ feet of

rather poor coal. It emerges on Troublesome creek probably in the neighborhood of Dwarf P. O. (half way between Bulls Fork and Montgomery branch), and at Hindman it is about 230 feet above the creek. Only near the head of the Right Fork, where the bed is low in the hills, is the bed known to be of workable thickness on Troublesome waters.

On the North Fork above Troublesome, the bed is first recognized on Grapevine creek near its mouth, 3 feet of coal, but it thickens to 5 feet on Eversole branch, where it is 100 feet above the river. On Henson branch, cannel coal appears at the bottom of the bed, which is hardly workable there, according to the section obtained, but beyond it improves to Fish-Trap branch, where it has over 4½ feet of clean coal. On Willard creek it is thin and continues so to beyond Big creek, but thence to Hazard it is workable.

From Hazard, where the bed is about 80 feet above the river, up to the head of Carr fork and on Rockhouse creek the bed has generally 3 to 5 feet of coal, sometimes part cannel, sometimes, where with most coal,with several partings, nowhere prohibitive of mining. On Carr its maximum height above the creek is about 200 feet, but toward the head of Rockhouse it lies close to the tops of the hills. On Line fork it appears to be thin, except near Pine Mountain, where it has 3 feet of coal on the parting and none under it. It goes below drainage about three miles west of Hurricane gap.

Above Line fork the coal has not been found of workable thickness.

On Middle Fork the bed has not been recognized below Guys creek, where it is about 240 feet above the river, 4 feet of coal with thin characteristic parting. Beyond this creek it is thin to Cutshin creek, where it runs nearly the whole length of the creek, 3 to 4 feet of coal near the bases of the hills.

It reaches probably its maximum thickness on Middle

Fork, nearly 6 feet of coal, 170 feet above the river, two miles up Rockhouse creek, but is thin again at the head of the creek.

From Hurst branch southward what little is known of the bed indicates worthlessness, until it comes near to drainage level. Then for a few miles before going below drainage towards the heads of Greasy creek, Beech, and the main forks the bed shows 3 to 4 feet of coal in many places, with hardly any not workable.

On the South Fork numerous openings into this bed on the east side of Red Bird creek indicate a constant workable thickness of coal, which a closer examination shows to be illusive. There are, doubtless, a number of areas which can be worked profitably when means of transportation is provided, but they need to be examined in detail to determine their extent, and for this purpose the latter part of this report will serve as a beginning.

On the west side of Red Bird the bed has been found of workable thickness first on the head of Flat creek, high in the hill. From this point southward detached workable areas may be found, increasing in size as the head of Red Bird is approached, toward which the strata dip.

The bed goes below drainage with good thickness about a mile from the head of Red Bird, and appears again, its upper seam over 4 feet thick, (with parting three inches below the coal), two miles down the Left Fork of Straight creek.

With some uncertainty as to correlation, the 4 feet of coal, low down near the head of Goose creek, is referred to this bed. It is the only thick coal above the Manchester bed on Goose creek waters known to the writer.

The quality of the coal in this bed is as variable as the

thickness. It is occasionally in whole or in part cannel, and, where thick, usually a considerable portion is splint coal. The soft coal, with few exceptions, appears to be good and sometimes suitable for making coke.

Fire-Clay Coal Rider.—This bed is probably the most variable of any coal of the region both as to its position relative to the coal below it and as to the thickness and quality of its coal, and it owes its importance largely to its association with the Fire-clay coal. Its distance above the latter varies, apparently, from actual contact up to 30 feet, and sometimes even 60 feet, though it is quite possible that in the latter case another seam of coal has been mistaken for it. Its thickness of coal varies from nothing up to 5 or 6 feet, and though probably most frequently found as cannel, in whole or in part, it often carries only common coal.

On North Fork waters the bed is generally absent or so thin as to be unnoticed, only on Lost creek and Line fork (Defeated creek) showing a thickness approaching importance, having in both places 35 inches of coal with thin parting additional. Mention should also be made of the splint bed at Thomas Johnson's shown in figure 59.

On the Middle Fork, Hell-for-Certain creek gives the bed's first exhibit, with 1½ feet of coal, but only well up the main streams above does it give indications of value, and these are not continuous. Its 5 feet of coal on Cutshin above Pauls creek; its apparent contact with the Fire-clay coal on Greasy creek, Elk branch; and reported 46 inches cannel on Tantrough branch, and 38 inches on Beech fork, Oldhouse branch, prove possible working areas, which, however, must be regarded of small extent, because openings not far distant from each show the bed of much less thickness.

On the South Fork the bed is first noticed on Red Bird creek, thin, on the head of Big creek; and again thin, but cannel coal, near the head of Red Bird. Between these two points a few openings of thick coal have been found, but the amount of coal which can be obtained from them is probably very small.

About the main heads of Goose creek other workable deposits may be found, but the bed has not been identified on Goose creek waters. Opposite the head of Collins fork, on Stinking creek, it has 3 feet of solid coal.

Haddix Coal Bed.—Comparatively little is known of this bed, partly because frequently in part cannel it partakes of the nature of that coal in occurring only at intervals in thick pockets, and largely because of its being ordinarily under a massive sandstone, its outcrop at the back of a wide bench where it is deeply covered. Its exposures are somewhat rare and its identification is apt to be difficult. Wherever tested it has proved remarkably pure, both as cannel and as bituminous coal. Though probably without any large continuous workable area, its pockets furnish a large amount of particularly fine fuel, and probably far more than is yet developed.

One of its most promising areas is on Lower Troublesome creek and its vicinity, where the bed is well known though not fully developed. At the mouth of the creek the coal reaches a thickness of nearly 4 feet, and on Russell branch 4½ feet, but with thin partings. Up Lost creek it soon becomes thin, but on Bear branch and on Williams fork of Buckhorn it appears as nearly or quite 3 feet thick. On Trace branch of Troublesome (near Dwarf P. O.), it has a foot of cannel, with less bituminous coal, and, so far as known, does not attain workable thickness farther up the creek.

Probably a second pocket lies up the North Fork, the bed showing well on Caney and Georges creek and reaching its maximum known thickness, 88 inches, on Wolf creek.

On Grapevine creek it has over 4 feet of coal, running down to 3 feet on Rock Lick branch, and to 32 inches on Pigeon Roost branch. Farther up North Fork waters it has been found only thin, excepting on Line fork towards its head, where it has nearly 5 feet of coal. Between Leatherwood and Line fork, and perhaps farther west, the bed appears to separate into two distinct beds.

On the Middle Fork it is first recognized on Long's creek, 6 feet thick, but is down to 3½ feet five miles above Long and to 3 feet near Squabble creek. At five miles above Guys creek it has 2 feet of bituminous on 10 inches cannel coal, and beyond, up Middle Fork waters, it has been found only with such heavy partings or thin coal as to make it of no value, except in one place on Cutshin creek. On Coon creek, a branch of Wolf, it has 4 feet of coal and 3 thin partings.

On South Fork waters it has little workable area excepting near Kentucky ridge, and nowhere there is it known to have workable thickness of coal.

Hazard Bed.—This bed appears to have good thickness, ranging generally from 4 to 8 feet of coal, on North Fork waters, with an average of perhaps 4½ to 5 feet. It has usually two partings, sometimes three and even four, but they are generally thin and occasionally wholly absent. Though containing more or less splint, the coal is generally softer than that of the beds below and more likely to make good coke.

About the mouth of Troublesome creek the bed is too high in the hills to carry large areas, but its 4½ to 5 feet of

coal will induce early working, and in Flint ridge, between Troublesome creek and Jackson a considerable area is available. Also, on the ridges between the North Fork, Lost and Troublesome creeks, Ball's and Long forks and Buckhorn, large areas of the coal have been found, reaching a thickness of over 7 feet, and nowhere but on Fifteen-Mile creek, near the head of Lost creek, known to be under 3 feet in thickness. There it has 34 inches of coal without parting, and at other points where there is less than 4 feet of coal the partings have been found absent. About the heads of the shorter of the above streams the coal is near water level and consequently has good area.

Up Lots creek and on the ridges north of it the coal appears to continue of good thickness, but being largely cut out by side valleys comparatively little is known of it. At the head of Lost creek it has considerable area with 4 feet of coal opened, and small area near Hindman with 3½ feet mined.

On the North Fork waters from Troublesome creek to Hazard the bed appears to be continuously good, except that on Carnegie branch, opposite the head of Sixteen-Mile creek, the coal shows a little less than 3 feet. Opposite Hazard, on the Big creek road, it makes a fine showing at the Combs mine, 55 inches of coal, largely splint, without parting.

Between Carr fork and Rockhouse creek, up to Love branch, there is a considerable area of the coal, but nothing is known of it there.

Between Rockhouse and the North Fork it is too high for workable area.

Towards the head of Leatherwood it ranges from 4 to 5½ feet of workable coal, and on upper Line fork from 5 to 7½ feet, with considerable areas on each stream.

On the Middle Fork waters it has been found thick only in the vicinity of Kentucky ridge, where it has large areas.

On Cutshin creek, Laurel fork, it has 5½ feet of nearly clear coal, of which almost two feet is cannel, and at the mouth of Isaac branch, head of Greasy creek, 4½ feet bituminous. On Beech fork it has 3½ to 4 feet, but on the main head the bed is not known.

On South Fork waters there are but two known openings into the bed giving thick coal. They are on Big and on Sugar creeks, not far apart, giving 4 and 7 feet, respectively, of workable coal.

A good area of this coal lies in the main ridge east of Red Bird creek, but the coal has been found only thin or much split up farther up Red Bird. It is not known on Goose creek waters, being generally high in the hills or too high to touch them.

Flag Coal.—This coal lying often near the Hazard bed, and sometimes with similar coal and partings, may easily be mistaken for the latter. It is not infrequently in part cannel coal, which is rarely the case with the lower bed.

About the mouth of Troublesome creek the bed shows favorably, but too near the tops of the hills to be of much importance.

Up Lost creek it appears to be thin to above Ten-Mile creek, but then, on Collins branch, it has nearly 5 feet of coal; and from Fifteen-Mile creek to the head it is finely developed, with openings on either side of the main ridges ranging from 3½ to nearly 9 feet of coal, most of them over 5 feet, and a large area available. In connection with the Hazard coal below it, this region is particularly favored, but its

prominence may be due in considerable measure to the more thorough development than has been made elsewhere.

Another valuable area lies in Flint ridge, west of lower Troublesome creek where the coal is 4 to 6 feet thick.

On the head of Long fork of Buckhorn it is 5 feet thick, with the Hazard coal opened to about the same thickness directly under it.

On Troublesome for a few miles above Buckhorn it appears to be thin, but rises to 7 feet of coal opposite the head of Lost creek, falling back soon to 3½ thick. Farther up Troublesome it is unknown.

On the North Fork above Troublesome it soon gets thin, and then has not been identified until on Peach Orchard branch, across from the head of Sixteen-Mile creek, where it has nearly 8 feet of coal, of which one and one half feet is cannel; and again on Carr fork, at the head of Irishman creek, 5 feet of coal. On Maces creek, near its mouth, what is probably the same bed has nearly 5 feet of coal, while on Line fork it shows less than 2 feet, and again, near its head over 5 feet. As with the bed below, it is too high to be workable east of Rockhouse creek or south of it, but the Kentucky ridge extension along Line fork must have a good area of it.

On the Middle Fork waters it appears to be thin and generally of small area, excepting towards the main heads, and but few openings into it are known. With 3 feet on Wolf creek (of Cutshin), over 5 feet on Reuben branch, Beech fork, and 3½ and 4 feet on the main head, the prospect is good for a very valuable bed all along Kentucky ridge, which apparently has had no openings made on its north side, except where natural exposures of coal induced them. A systematic search for coal may reasonably be expected to develop much heretofore unknown.

On the South Fork the bed can be only in the vicinity of Kentucky ridge, where it is not known to have been opened.

Hindman Coal Bed.—With hardly more than a dozen openings into this bed in the whole region, it may yet be said of it that it is probably the one of most constant good thickness, and it seems to be a question of area rather than of thickness which gives it value. A number of heavy coal stains seen, but not opened, tend to confirm this opinion. The coal appears also more uniform in quality than that of other beds, and more promising as a coking coal.

On the Left fork of Troublesome creek it gives its least thickness, hardly 4 feet of coal, and on the Right fork its greatest, 9½ feet, but with little area at either place.

On the heads of Big creek (west of the mouth of Carr fork) it has 5 to 6 of coal, with six inches of cannel in one of them, and on Little Carr 6½ feet, also with little area at either place.

The remaining eight known openings are all on Middle Fork waters above the mouth of Cutshin creek, and they range in thickness of coal from 4 to 7 feet. But excepting in Kentucky ridge and the high spurs jutting northward from it, there can be little available working area of the bed. A systematic development of the bed there is much needed.

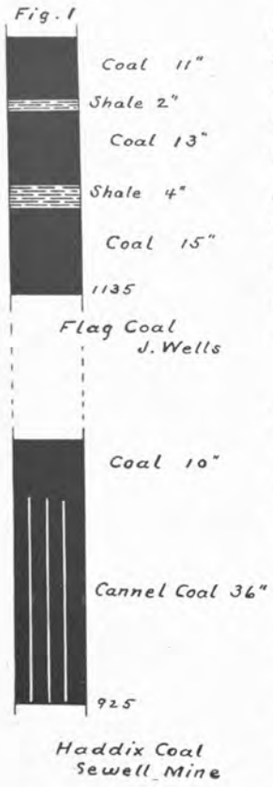
On the following pages are given details of openings visited, together with a running description of such matters as might merit notice in connection with them. For convenience of reference they are arranged geographically, the main streams being taken up in succession from left to right; and they are followed from lower points up to their heads, taking their tributaries as they come, and always working as far as this allows from left to right. These terms, left and right, are used invariably as when looking up stream, being preferred

to the use of points of the compass because of the crookedness of the streams.

Surface distances, given in miles, are from the best sources available, often simply guesses, never from measurement on the ground. They are, like the sea-level elevations, intended to serve as a convenient approximation and aid to future examination, whether by the casual visitor or for thorough exploitation. While elevations are without doubt in many cases far from correct, they will serve for relative heights in all localities, and help in correlations, which are not yet fully determined. In the same way underground distances, in yards, are given without attempt at accuracy. Thicknesses of strata given in feet are approximate only; given in inches they may be relied upon as correct.

KENTUCKY RIVER, TROUBLESOME CREEK.

Figure 1 represents the coal of the old Haddix or Sewell mine (Now Hargis Mine?) opposite the mouth of Troublesome creek, and of a higher old opening on the east side of the river, as given by P. N. Moore, formerly a member of the Survey. Those openings lie near the foot of the long southerly slope of strata extending from the Wolfe county boundary of the coal fields, the center of a small stratigraphical basin having been formed about or near the mouths of Troublesome and Quicksand creeks. For a short distance southward from the mouth of Troublesome and Lost creeks a somewhat rapid rise of strata has occurred.



The lower of the two coals, 240 feet above the river, is of the Haddix bed. Northward and westward this bed appears to be of little value, but up Troublesome a few promising openings, and up the North Fork more of them, give assurance of its being an important factor in the development of the field in this vicinity.

The quality of the coal, generally excellent in this bed, is well indicated by the following analyses, Nos. 160, 170 and 2282, the two former sampled by Mr. Moore, the latter by Mr. C. G. Blakeley, analyzed by Dr. R. Peter of the Kentucky Geological Survey; and "A" and "B", samples from the Hargis mine, analyzed by Prof. Thomas Egleston, of Columbia College.

HADDIX COAL.	HADDIX MINE. No. 160 Cannel	No. 170 Cannel	No. 2282 Cannel	HARGIS MINE. "A" Cannel	"B" Bituminous
Moisture	1.10	1.30	1.60	2.78	5.27
Volatile comb. matter	48.90	47.00	46.60	48.22	38.00
Fixed carbon	47.00	44.40	46.80	44.24	52.02
Ash	3.00	7.30	5.00	4.76	4.71
	100.00	100.00	100.00	100.00	100.00
Sulphur	0.241	1.574	0.824	0.78	0.84
Specific gravity	1.211	1.65	1.212		
Color of ash	buff	brownish gray	brownish gray	s'dust	s'dust
Coke		dense	dense spongy		

The cannel is a clean, tough, elastic, pitch-black coal, in appearance as in the above analyses well meriting the high regard in which it was held in Central Kentucky, where it was much used before the introduction of cheap coal by rail led to the abandonment of shipments by boat down the river.

Fifty feet below the upper bed of figure 1, and 350 feet above the river, Mr. Moore noted a coal stain, reported 4 feet thick, which belongs to what is now named the Hazard bed. The report of its thickness is probably true, but in view of the excessive partings which the bed sometimes carries, it cannot be predicted a workable bed, though the probability is in favor of it.

The upper coal, figure 1, is the Flag coal as found in the Wells opening, here 400 feet above the river. Though it is not unlikely that the 39 inches of coal is below the normal for this immediate vicinity, its nearness to the tops of the hills, and consequent small area and difficult access, and the fact that its partings are here constant, are unfavorable for early attack. Sampled by Mr. Moore, and analysed, with results below, by Dr. R. Peter, the coal shows much heavier ash than belongs to it, because the sample was taken in outcrop.

FLAG COAL. Chem. Report No. 1710.

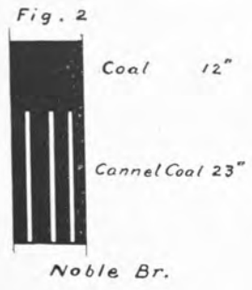
Moisture	2.78
Volatile combustible matter	35.52
Fixed carbon	44.94
Ash (light lilac gray)	16.76
	100.00
Sulphur	1.423
Specific gravity	1.398
Coke (dense-spongy)	61.70

"Sample from the outcrop where the coal is dirty, and hence will give somewhat more than the average ash percentage. A splint coal with thin partings of fibrous coal containing fine granular pyrites."

It does not appear that there are any other coals than those given that are of present value in this vicinity. The most favorable prospect is in the coals worked at Jackson and at Beattyville, which are below drainage here. That they will be worked in the future is probable, but unless they prove better than there is now reason to anticipate, the time when they can be made remunerative is yet far off.

Noble Branch.

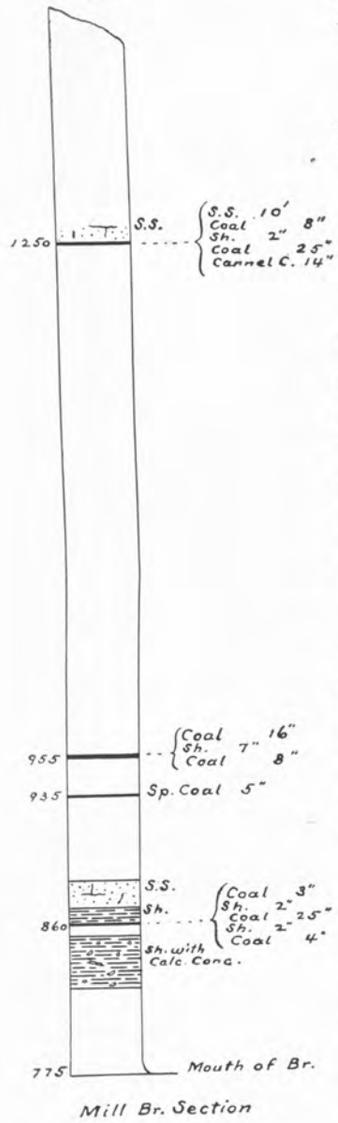
The section from Sewell and Little's land, figure 2, taken from Bulletin No. 3 of the Survey, was measured probably by Charles Hendrie and referred to No. 4, or Fire-clay coal. Its resemblance to the Haddix sections about the mouth of the creek makes it a question if it does not belong to that bed. An outcrop sample of the cannel sent by Mr. Hendrie, analysed by Dr. R. Peter, gave.



HADDIX BED. Chem. Report No. 3111.

Moisture	0.70
Volatile combustible matter	50.90
Fixed carbon	36.70
Ash (gray)	11.70
	100.00
Sulphur	3.845
Coke (dense)	48.40

Fig. 3



Lost Creek.

In Lost creek at its mouth is a thin bed of coal with parting, which, rising above drainage, appears among the small lower coals of the sections, figures 3, 6, 23 and 48, too numerous and unimportant to trace. They serve mainly to show that, up to the Haddix coal, there is little inducement here for further search.

What is probably the Haddix coal was opened by Judge Strong near his house at the mouth of the creek, apparently with unsatisfactory results. Though wholly bituminous in the entry there, its outcrop gave blocks of cannel coal in an adjoining field.

Mill Branch.—This branch is tributary to Lost creek, on the right about two miles up.

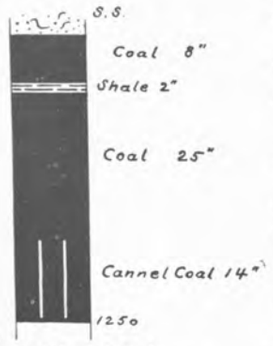
The most promising of the lower beds is that of the section, figure 3, 180 feet above Lost creek, which belongs to

the Fire-clay, or Hyden, coal bed. It has been mined here to a slight extent, though yielding but 24 inches of rather poor coal. My underground sample gave, by Dr. R. Peter's analysis:

FIRE-CLAY COAL.	Chem. Report No. 2528.
Moisture	1.40
Volatile combustible matter	35.90
Fixed carbon	52.50
Ash (dark purplish gray)	10.20
	100.00
Sulphur	3.483
Coke (spongy)	62.70
Specific gravity	1.366

"A pure-looking rather dull black coal; generally breaking in irregular laminae, with some little fibrous coal between, but no apparent pyrites, some portions breaking with irregular shining fracture."

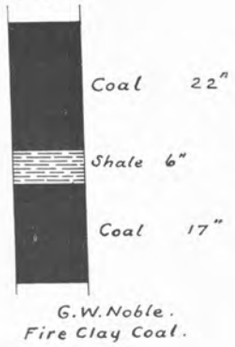
Fig. 4



At the time the section was taken, the Haddix and Hazard beds had not been found on Mill branch, but the Flag coal was opened, showing well, as in figure 4.

Though risen somewhat over 100 feet from the mouth of Troublesome, the coal probably has no less area here than there, because of the greater height of hills. It appears to be at this point on the crest of a wave of the strata, or rim of a basin, but a correction of errors of elevation may reverse the apparent slight dip southward to Cockerel fork.

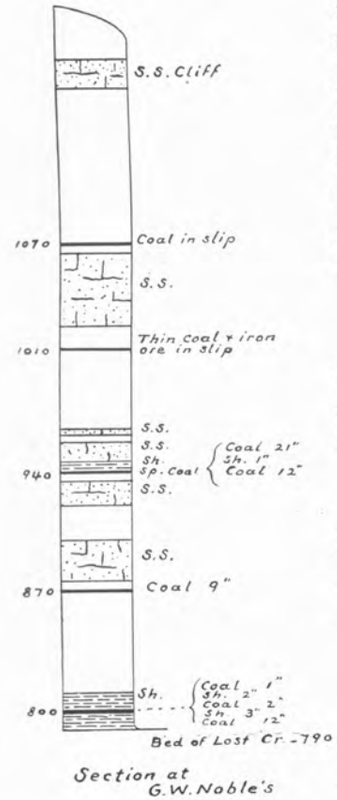
Fig. 5



A half mile west of G. W. Noble's house, below Leatherwood branch, the Fire-clay coal shows, as in figure 5, such improvement as to induce further investigation, but its quality needs careful testing before its value can be fixed.

The section, figure 6, shows in its lowest bed a continuation probably of the lowest bed of figure 3, (a bed quite conspicuous about Hazard, but valueless there because of its many partings). Its increased distance from the Fire-clay coal, at elevation 940, is due not so much to a greater interval between the two beds, as to the pitch of strata between the two points where the beds were exposed. The actual distance is probably less than 100 feet.

Fig. 6



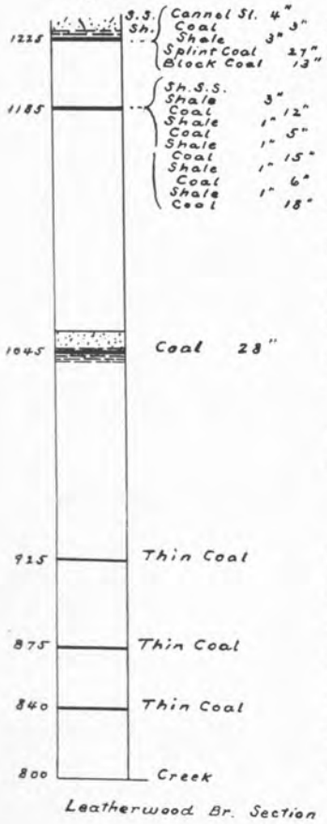
The Fire-clay coal was opened a mile above Mr. Noble's house. My sample of the 33-in. coal, analyzed by Dr. R. Peter, gave:

FIRE-CLAY COAL.	Chem. Report No. 2527.
Moisture	1.40
Volatile combustible matter	33.90
Fixed carbon	51.90
Ash (dark gray)	12.80
	100.00
Sulphur	3.156
Coke (spongy)	64.70
Specific gravity	1.363

"A pure-looking, pitch-black coal. Fracture mostly irregular and shining. Very little fibrous coal apparent in it. No appearance of pyrites." The similarity of the Mill branch with this analysis is significant. The heavier ash of the latter, 2.6 per cent. difference, is due to having taken the sample from a muddy outcrop opening.

The upper, slipped, coal of the section is the Haddix coal, and the Hazard coal comes in on the sandstone at the top of the hill. While without working area on the hills by the main creek, it is but necessary to go back to the North Fork and Troublesome main dividing ridges to find the coal in bodies large enough to work.

Fig. 7

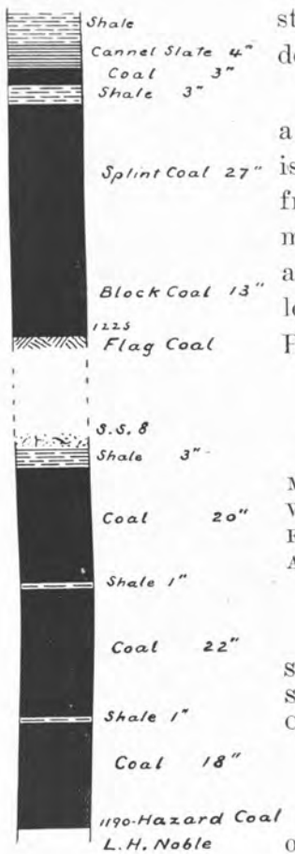


Leatherwood Br. Section

Leatherwood Branch. The section, figure 7, shows what is probably the Fire-clay coal at elevation 925. It was exposed, thin, in the branch by L. H. Noble's house. The 28-in. coal next above it is then the Haddix bed, which, showing greater thickness and cannel coal at frequent openings in the vicinity, should lead to further investigation here.

The Hazard bed, with its 5 feet of coal, on L. H. Noble's land, shown in figure 8, gives promise of an excellent working field in this ridge. The opening, when visited was in a very muddy condition, but, nevertheless, was sampled by me. In the following analysis a large allowance in the ash should be made for mud unavoidably included. With a corresponding increase in the other constituents a much better result would, doubtless, be obtained.

Fig. 8



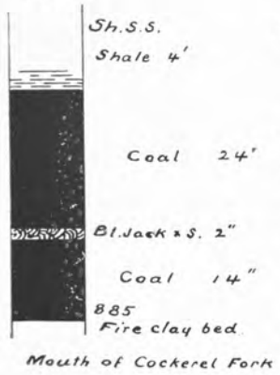
Leatherwood Br.

The Flag coal, not too high to yield a workable area, and of good thickness, is also shown in figure 8. The sample from this opening also included much mud which should be allowed for in analysis below. Both samples I collected, and both were analyzed by Dr. R. Peter.

Chem. Report No.	2614 Hazard Coal	2615 Flag Coal
Moisture	9.60	2.80
Volatile combustible matter	29.46	31.16
Fixed carbon	44.14	53.34
Ash (light brownish gray)	16.80	12.70
	100.00	100.00
Sulphur	0.478	0.690
Specific gravity	-----	1.384
Coke (pulverulent)	60.94 (dense)	66.04

Cockerel Fork. The next recorded opening of the Fire-clay coal bed is at the mouth of Cockerel Fork, 30 feet above the stream, and with section as in figure 9. The coal is not attractive in appearance, showing much marcasite, and the small hard parting of black-jack and sulphur is decidedly hurtful, if constant. It is the first appearance of the distinctive parting which characterizes the Fire-clay coal bed farther south, its occurrence as black-jack, instead of Fire-clay, hav-

Fig. 9



ing been noted at several widely distant points.

Passing several abandoned entries, at one-fourth mile up Cockerel fork is the upper one having 3 to 4 feet thickness including four partings. A mile up, where the bed goes into the creek, nearly level with the coal at the mouth, it has this section:

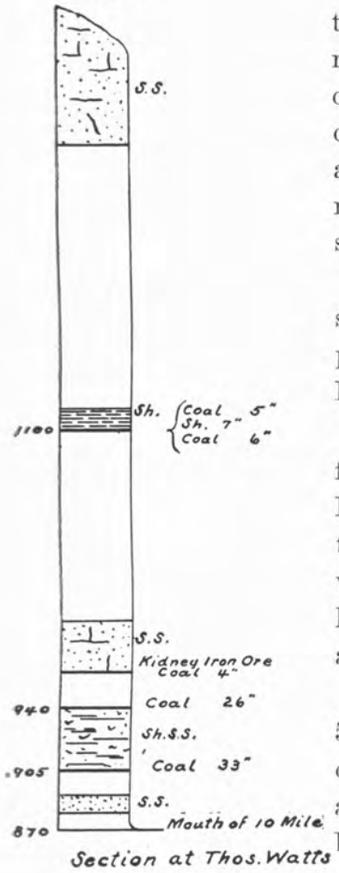
Shale and shaly sandstone	30 ft.
Hard coal	11 in.
Shale	3 in.
Hard coal	8 in.

with possibly more coal below the creek bed.

On the head of the Right fork, on the Noble farm, an old opening on a conspicuous bench shows the Hazard bed at elevation 1,100, about 3 feet thick, with sandstone roof.

The Flag coal half mile down stream from the Hazard opening, at elevation 1,200, with opening also fallen in, is evidently thicker. The dump shows some splinty, slaty, cannel coal similar to that across the ridge on Collins branch, where the bed is 5 feet thick. An increase of interval, from 50 to nearly 100 feet, between the Hazard and Flag coals is here noted.

Fig. 10



In Lost creek section, figure 10, taken above the mouth of Cockerel fork, near the Perry county line, the lowest coal, 33 in., is probably the Fire-clay coal. The 26-in. coal above it is noticeable as representing the Fire-clay coal rider, of considerable importance farther south, especially in Leslie county.

The thin splint coal with parting seems to be the Haddix bed, which appears to be without value farther up Lost creek.

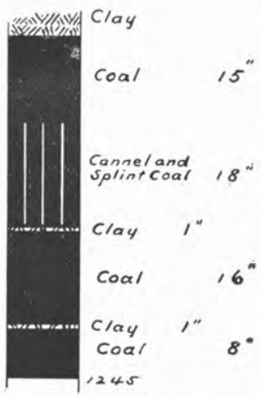
From Cockerel fork up Lost creek for two miles the sandstone under the Fire-Clay bed becomes prominent along the sides of the narrow, crooked creek valley, hardly enough so to merit notice here, but that it becomes at other points a characteristic feature of that rock.

Cliff-making sandstones, their tops 50 to 200 feet or more above the Flag coal, form the crests of the ridges, here, and most of the way on either side of Lost creek.

Collins Branch.—Perry county. On the left, two miles above Ten-Mile creek.

A half mile up the branch, on the left, is John Collingsworth's opening into the Flag coal, figure 11. The bed is

Fig. 11

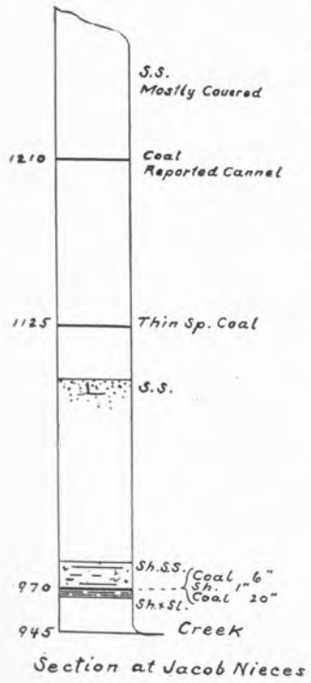


Flag Coal
Jno. Collingsworth
Collins Br.

barely uncovered, and in driving to roof it is not unlikely that the clay partings disappear. As it is the coal makes a good showing though the 18 in. of slaty cannel and splint coal does not add greatly to the value of the bed. That the cannel will continue slaty through the ridge is almost certain, for it is found so on Cockerel fork, but it may be marketable.

About a mile above Collins branch and below Fifteen-Mile creek the section, figure 12, was taken. A slight rise of strata would bring the Fire-clay rider of figure 10 to the level of the bottom coal of figure 12, of the same thickness, but instead there appears to be from Ten-Mile to Fifteen-Mile creek another reversal of the general pitch of strata, and the rider should be about 70 feet below the creek at Niece's. With such the case, the Hazard and Flag coals, the latter with cannel as in many cases, are shown higher in the section. No attempt was made by the Survey to open the coals here.

Fig. 12

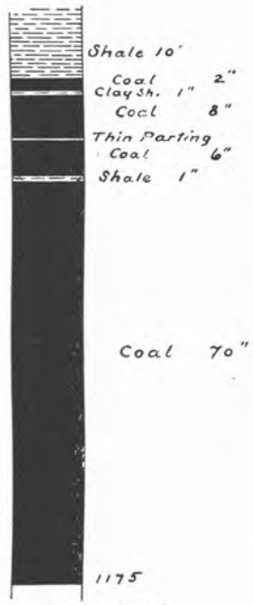


Section at Jacob Nieces

Fifteen-Mile Creek.—On the right, ¾ mile up and 115 feet above the mouth of this creek, the Hazard bed shows about the same thickness as on Cockerel

fork, being 34 in. thick, with sandstone roof, clean coal apparently, but the bottom eight inches was in water when visited and it may be in part shale.

Fig. 13



Flag Coal
Combs and Horton
15 Mile Cr.

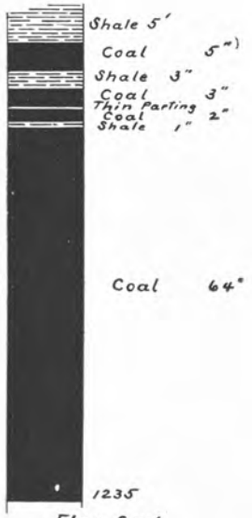
On the right, a mile up and 180 feet above the mouth of the creek, on the Combs & Horton tract, an 8-yard entry has been driven into the Flag coal, with the section shown in figure 13. The upper seams of this coal are soft, inclined to block; the main seam is mixed throughout with splint coal. My sample analyzed for the Survey, by S. D. Averitt, gave the following results:

FLAG COAL.	Laboratory No. 2733.
Moisture	2.48
Volatile combustible matter	35.51
Fixed carbon	52.43
Ash (yellowish gray)	9.58
	100.00
Sulphur	1.05
Phosphor	0.033
Specific gravity	1.337
Coke (dense-spongy)	62.01
Total carbon	70.95
B. T. U. per pound of coal	12,958

From this creek up to the head of Lost creek developments already prove a remarkably fine coal field. If, as laboratory tests indicate, good coke can be made from the coal, its value is immensely enhanced.

No other good coking coal lies so near to the northwestern markets.

Fig. 14

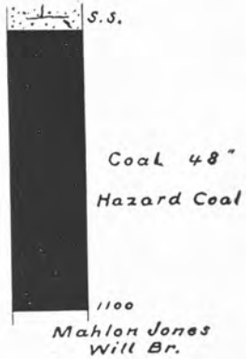


Sixteen-Mile Creek.—A mile up this creek to Stall's branch on the right, a mile up Stall's branch, in a right branch is again the Flag coal, poorly opened, but showing as in figure 14. It lies 60 feet above the mouth of Stall's branch and 240 feet above the mouth of Sixteen-Mile creek. The section and coal are so nearly like the preceding as to require no further comment.

Fig. 15

Again, at the Mahlon Jones entry on the left, a half mile above Sixteen-Mile creek and 180 feet above Lost creek, the Flag coal has the section at its face, six yards in, given in figure 15. It is more of a block coal, with less splint than in the two preceding openings, yet a glance at the figures shows their similarity and indicate correlation.

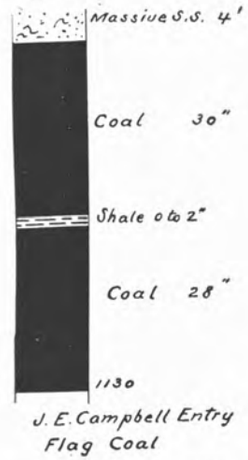
Fig. 16



Will Branch.—A branch on the left, three-quarters mile above Sixteen-Mile creek.

On the right of the branch, one-quarter mile up it, on Mahlon Jones' land, is the Hazard bed, approximately as in figure 16. Coal had been taken out from under the sandstone roof till the latter had fallen in and prevented exact measurement. The coal is good, bright and clean.

Fig. 17



At J. E. Campbell's, on the left of Lost creek, two miles above Sixteen-Mile creek, the Flag coal is opened with an entry of some 30 yards, figure 17. The coal is divided into two nearly equal benches by a parting running from two inches down to nothing. The roof of massive sandstone is unusual for this bed, though the cliff frequently shows itself a little above the coal. Called a shop coal, its appearance is favorable for coking. My samples, analyzed by the Survey chemists, gave:—

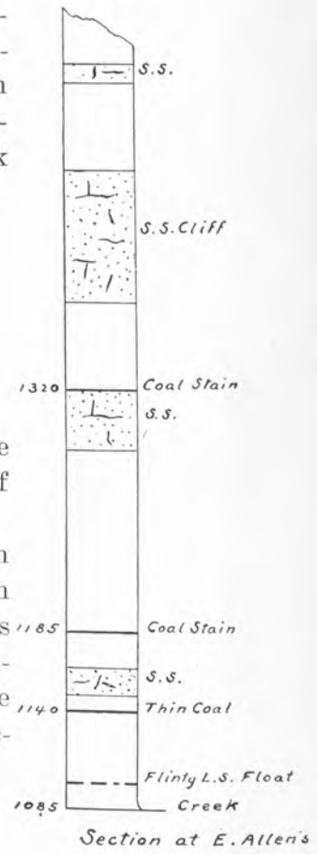
FLAG COAL.	Laboratory No. 2732.
Moisture	2.09
Volatile combustible matter	38.61
Fixed carbon	54.21
Ash (light buff)	5.09
	100.00
Sulphur	0.83
Phosphorus	0.007
Coke (dense spongy)	59.30
Specific gravity	1.297
Fixed carbon	74.24
B. T. U. per pound of coal	14,018

Fig. 18

"Soft, light, rather pure-looking coal, with some ferruginous incrustations. Its low phosphorous and sulphur and moderate ash are worthy of especial notice."

The Farris Jones opening figure 18, near the mouth of Rock fork and 180 feet above it, two and one half miles above Sixteen-Mile creek, gives the Flag coal at its best, though imperfectly opened. It appears likely to prove equal in quality to the Fifteen-Mile creek coal analyzed.

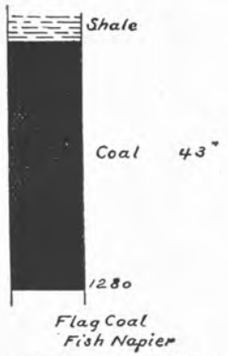
Fig. 19



The section, figure 19, shows the coal seams found about the mouth of Rock fork in 1885.

There being at that time no reason to suspect the presence of thick coal in this vicinity, the position of the beds found was noted, but no further investigation made. The hills here show the prevalence of sandstone, largely replaced by shale farther down the creek.

Fig. 20

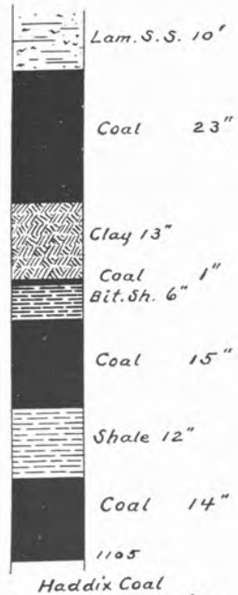


At Fish Napier's four miles above Sixteen-Mile creek, one quarter mile up a small branch on the right, the Flag coal is opened again, 100 feet above the creek, as in figure 20.

Fig. 21

Again, one quarter mile farther up and a half mile from the head of the creek, an old opening on the left of the road, 40 feet above it, gave the section, figure 21. Twenty-five feet under this coal is eight inches coal, the interval mostly shaly sandstone.

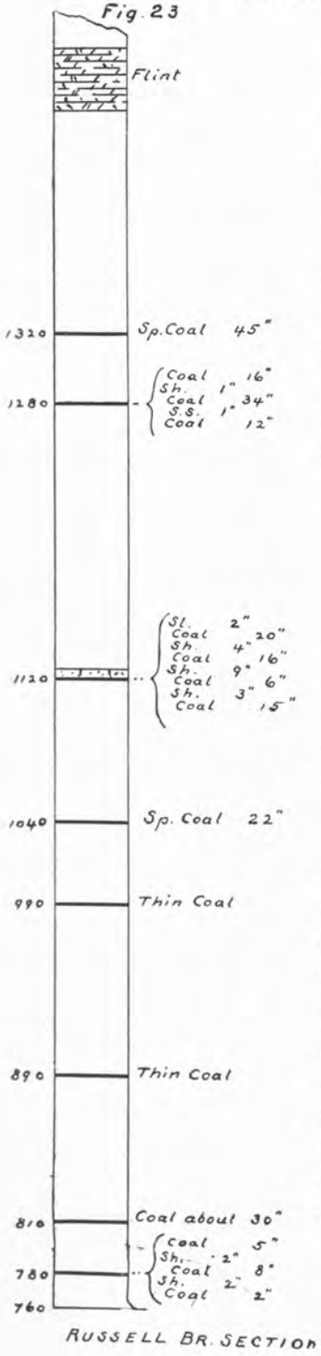
Fig. 22



A mile above Lost creek a small branch enters Troublesome creek from the left, along which the following section was obtained:—

10-ft.	Massive Sandstone	1135
10-ft.	Laminated Sandstone	1112
	Davis Mine	1105
	Big Bench	1005
	Top (?) of cliff sandstone	910
	Thin coal	845
15-ft.	Shaly sandstone.	
	Thin coal	830
	(Cliff sandstone under coal)	
	Mouth of branch	735

The benches here have served to allow the coal beds to be covered deeply, and also are an aid to their approximate location. It is probable that the Fireclay coal is on the sandstone at elevation 830, and the Haddix on the bench 175 feet higher. The Clinton Davis mine, at elevation 1105, a half mile up the branch



and 100 yards to the right, is in the Hazard bed. The prospect of a material reduction of partings farther underground is not good, as they show badly where well under cover.

The George Colman entry, recently opened, about two miles above Lost creek and a mile below Russell branch, 40 feet above the creek, has 30 inches coal and eight inches shale in three partings. Its roof is bituminous shale. This bed probably lies some 120 feet below the Fire-clay coal.

Russell Branch.—The section, figure 23, was taken from the mouth of Russell branch nearly to its head, but the strata between beds seem to lie nearly level along the stream, so the intervals are nearly correct.

The Colman coal is here the 30 in. clean coal near the bottom of the section, the Fire-clay coal probaby the thin coal of elevation 990; above this its rider with a variation of 21 in. in thickness of coal in a distance of 100 yards. (From James Rholley's spring nearly to the outcrop crossing of the branch). The possibility of a further increase of thickness of this fine, bright, splint coal under the branch should lead to a thorough test of it.

Of the three principal Russell branch beds, represented in figure 24, the two lower, the Haddix and Hazard beds, were measured at outcrop openings where the partings were probably excessive, and my samples, including all the coal seams of each bed, must have included some extraneous matter. Though each sample showed weathering, the difference between a solid outcrop, as in No. 2530 and a soft outcrop, as in No. 2531, is well illustrated in the ash of the following analyses by Dr. R. Peter:

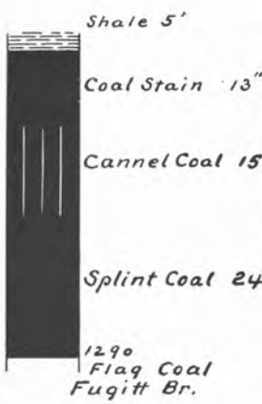
Chem. Report No.	2530 Haddix Bed	2531 Hazard Bed
Moisture	3.80	4.20
Volatile combustible matter	35.60	32.40
Fixed carbon	54.80	52.26
Ash	5.80	11.14
	100.00	100.00
Sulphur	0.875	0.848
Specific gravity	1.345	1.426
Coke (dense)	60.60	63.40
Color of ash	salmon	very light gray.

No. 2530.—"In rather thin, irregular laminae, with ferruginous stains on some exterior surfaces."

No. 2531.—"Seems to be splint coal."

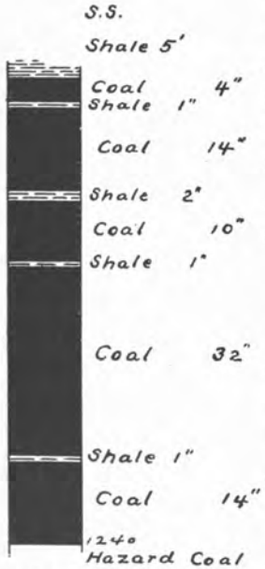
The Flag coal (figure 24) has here no cannel, but is a very attractive-looking, bright splint, with covering enough to make it an important bed of this ridge.

Fig. 25



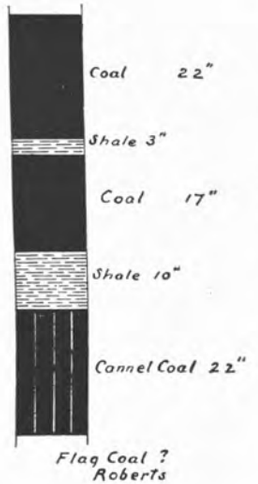
The remarkable occurrence of flint shown at the top of the section (figure 23) lies for some miles along the crest of the ridge, about 30 feet thick, varying in color from white, through yellow and browns to black. Though weathered, and the fragments carried in abundance down the branches to Quicksand creek, very few of them appear to be taken towards Troublesome creek.

Fugitt Branch.—Considerable coal has been taken for local use from an entry into the Hazard coal shown in figure 25, nearly level with and by the low gap at the head of this branch. The coal is 440 feet above the mouth of the branch, but a good working area of it lies on either side of the gap. A large bench marks the position of the bed here as at many other points.



The Flag coal opening, just above the Hazard mine, having fallen in, accurate measurement of the bottom coal was not obtained, but the 24 in. given in figure 25 is nearly correct; it is in one solid block. The 15 in. seam above it is cannel, but of rather poor quality apparently. The opening needs extension to determine the value of the bed, both as to quality and quantity, but, on the whole, it gives good promise.

Fig. 26



Near the mouth of Fugitt branch Mr. Moore examined on the Robert's farm what is probably the Hazard bed, with section shown by figure 26. But the presence of cannel in the bottom seam makes the correlation doubtful, and, again the cannel coal is of uncertain character. Mr. Moore's samples of the three seams of the bed, analyzed by Dr. R. Peter, gave the following results. It is to be inferred that the top seam, with its high ash, was sampled from a very muddy outcrop.

Chem. Report No.	1702 Top.	1704 Middle.	1703 Bottom. Cannel.
Moisture	3.30	2.20	3.40
Volatile combustible matter	31.44	39.20	43.40
Fixed carbon	49.76	51.14	46.96
Ash	15.50	7.46	6.24
	100.00	100.00	100.00
Sulphur	0.991	2.525	0.630
Specific gravity	1.405	1.290	1.280
Coke	65.26	58.60	53.20
	dense friable	spongy	friable
Color of ash	pinkish-gray	lilac-gray	light buff gray

No. 1702. "A splint coal, splitting into very thin laminae with fibrous coal between, but with no appearance of pyrites. The sample has a weathered and tarnished appearance, showing ferruginous and earthy stains."

No. 1704. "Rather a dull-looking coal, apparently pretty pure, having but little apparent fibrous coal or pyrites between

its laminae. Exterior of some of the lumps covered with ferruginous incrustation.''

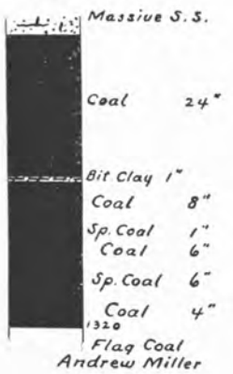
No. 1703. ''Called cannel. A pure-looking coal with but little fibrous coal and no apparent pyrites. Sample somewhat mixed in character. Some pieces of cannel coal; others splint coal; others apparently shaly.''

The questionable character of the cannel sample as described above by Dr. Peter leads to the belief, in the absence of conclusive data, that this is the Hazard bed, showing a tendency to cannel coal in its bottom seam, a very unusual occurrence.

BUCK HORN CREEK.

Bear Branch.—A mile and a half up this branch, on the right fork, just beyond and 100 feet higher than Andrew Miller's house, the Haddix coal has been opened, but is now partly covered. Somewhat more than three feet of coal, apparently without parting, with five feet of shale roof, was indicated. Being but about 340 above the mouth of the branch a large area of workable coal may be confidently looked for here.

Fig. 27



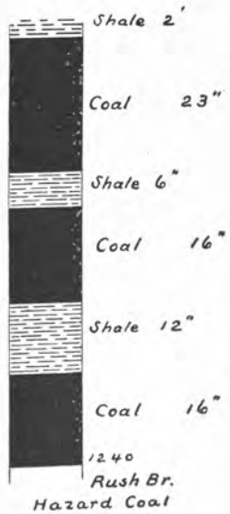
Near the head of the left fork, 30 feet above the conspicuous bench of the Hazard bed, the Flag coal has been opened by Mr. Miller, at a height of 490 feet above the mouth of the branch, yet still with a fair amount of covering. Figure 27 shows this coal with parting of but one inch mother coal or bituminous clay. The top seam is a good, bright, somewhat soft coal: the bottom 25 in. has one 1 in. and one 6 in. seam of dull, splint coal, apparently not bone, and this whole seam is comprised in what may be mined

as one block. In this 30 yard entry the bed makes a fine showing. The direction of the faces of the coal changes in that distance perhaps 10 degrees.

At the mouth of Long fork, 330 feet up, S. M. Noble has an eight yard entry, partly filled with water when visited, which was judged by eye to have about the section given below. Two gray bands on the coal may have come from two thin clay partings additional, but they are probably outcrop effects only. The bed is so like in section to the Roberts opening, page 45, as to leave no doubt of their identity.

Shale	8 ft.
Coal	2 ft.
Shale	½ ft.
Coal	2 ft.
Shale	1 ft.
Coal	1 ft.

Fig. 28



LONG FORK.

Rush Branch.—A small branch on the right two miles up Long Fork.

The Hazard bed is open here, on the Taulbee & Allen tract, at the head of a branch on the right, less than a half mile from and 320 feet above the mouth of Rush branch. Its section is given in figure 28, corresponding well with the coal opened at the mouth of Long fork

Toward the head of Rush branch and on the right, 80 feet higher than the preceding opening, the Flag coal bed gives 31 in. coal without parting.

Williams Fork.—This stream is also on the right of Long fork and two and one half miles up.

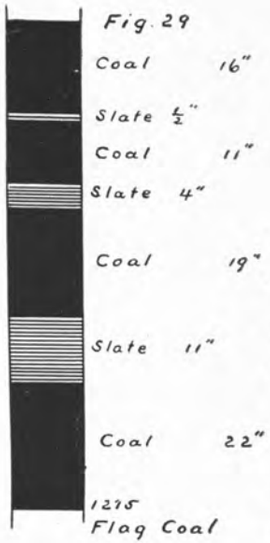
A quarter mile up Williams fork, 60 feet above its mouth, on a right branch, what is probably the Fire-clay coal, with sandstone roof, is opened by a small entry showing 32 in. to 35 in. of fine-looking coal, mostly splint.

Still on the Taulbee and Allen tract, on the opposite side of Williams fork, 200 feet above its mouth, the Haddix bed, with sandstone roof, has 33 in. coal without parting.

Combining the openings of Rush branch and Williams fork the following section is obtained, which should be useful in further much needed prospecting in this region.

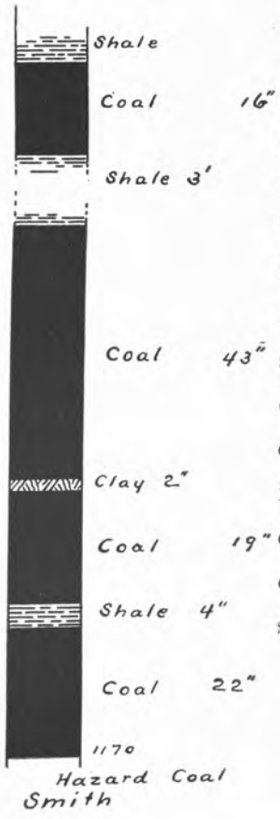
Flag Coal	31 in.
Interval	80 ft.
Hazard bed (2 partings) coal	55 in.
Interval	90 ft.
Haddix bed (S. S. roof) coal	33 in.
Interval	50 ft.
Coal	20 in.
Interval	90 ft.
Fire-Clay coal (S. S. roof)	32 to 35 in.
Interval	60 ft.
Coal in mouth of Williams' fork	thin

At the widow Fugitt's, in front of her house, at elevation 1220, and 270 feet above the mouth of Williams fork, an entry showed about three feet of coal with, perhaps, two feet more under water. This is probably in the Hazard bed with the lower seam still undiscovered there. With Chestnut gap (to Lick branch) 250 feet higher, and peaks rising some 200 feet above it, a large area of this coal is here available.



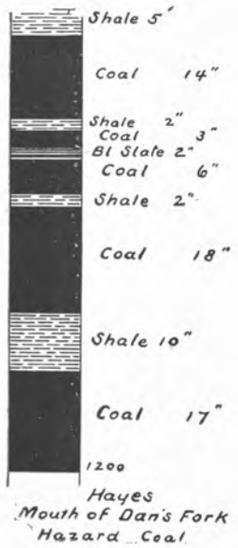
The Haddix coal shows again at water level one quarter mile below the Smith house at the head of Long fork on the road to Lick branch, coal 34 in. under sandstone: elevation 1170.

The Smith openings into the Hazard and Flag coals are shown in figure 29, the lower coal but 20 feet above the creek.



By elevations given for these coals there is a slight dip up stream, but it is not unlikely that this is an error due to variation of barometer. The lower bed is given from my own measurements; the upper by reliable report, though the slate therein should probably more properly be called shale. But that the two openings are one directly above the other it would be presumable that they were duplicates of one bed. The two beds so close together make a particularly handsome showing.

Fig. 30



Little prospecting seems to have been done on Buckhorn above Long fork, and most of the openings made are not in condition to examine. Thick coal is reported found on Coles creek in Knott county, but openings fallen in.

Dan's Fork.—On the right, 7 miles above Long fork.

At the mouth of this stream, on the Hayes tract (now Pardee) 250 ft. above the creek, the section shown in figure 30 was obtained, in an eight-yard entry. My sample, analyzed by S. D. Averitt, including all the coal of this bed, of which the lower benches appeared particularly fine, gave the following results:

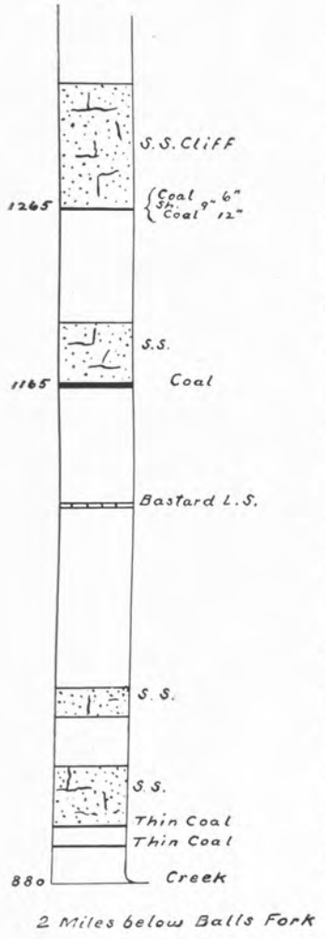
Laboratory No.	2735.
Moisture	1.76
Volatile combustible matter	41.98
Fixed carbon	49.67
Ash (reddish yellow)	6.59
	100.00
Sulphur	1.83
Phosphorus	0.013
Specific gravity	1.294
Coke (dense-spongy)	56.26
Total carbon	72.97
B. T. U. per pound of coal	13,862

"Average sample like 2732, (soft and light) but considerably weathered, and with a good deal of ferruginous incrustation." No. 2732 is from the Hazard bed at the head of Lost Creek.

That this is one of the two Smith coals at the head of Long fork can hardly be questioned, but in the absence of any data by which they can be distinguished here, the other needs

to be found to determine which this is. It more nearly resembles the general characteristics of the Hazard bed.

Fig. 31



The section, figure 31, was taken on Troublesome creek, about six miles above Buckhorn creek and two miles below Ball's fork. It is likely that the fire-clay coal is represented by one or both of the thin coals at the bottom of the section; the Haddix is then near the bastard limestone. The Hazard bed, unusually thin for this vicinity, is shown in detail in figure 32. The Flag coal also, under its customary sandstone cliff, is remarkably thin. It is quite possible that another bench of this bed lies underneath the coal found, with a thick parting between. Above this coal the hill is not high enough to afford a workable area to a higher bed.

Fig. 32

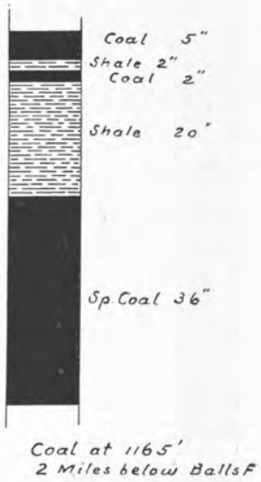


Fig. 33

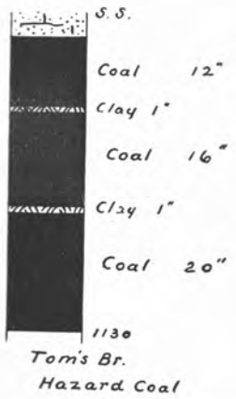


Fig. 34

TOM'S BRANCH.

On the right of Troublesome creek, opposite the line of section just given, the Hazard and Flag coals have been found of excellent thickness, as shown in figures 33 and 34.

The lower bed, 245 feet above the mouth of the branch, is opened enough to show a good bright coal, inclined to block, with thin clay partings which may be expected to run out.

The upper bed, 95 feet higher, though not opened to a roof, is proven very satisfactory in thickness.

Both beds being well developed on Lost creek makes fully certain in this locality a large area of thick coal in each. Lying nearly level they can be worked to advantage on either the Lost creek or Troublesome creek side of the dividing ridge.

WILLIAMS BRANCH.

On the left, one mile above Tom's branch and below Ball's fork. This branch heads against Williams fork of Buckhorn.

On it, one and one quarter miles from and 200 feet higher than its mouth, at elevation 1100, the Haddix coal has been opened with the section following:—

Sandstone	10 ft.
Shaly sandstone	15 ft.
Shale	3 ft.
Coal	18 in.
Cannel coal	4 in.
Shale	9 in.
Clay	8 in.
Coal	6 in.

Fig. 35

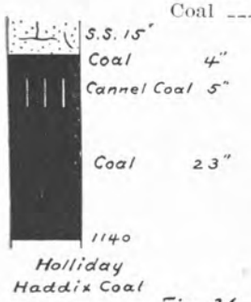
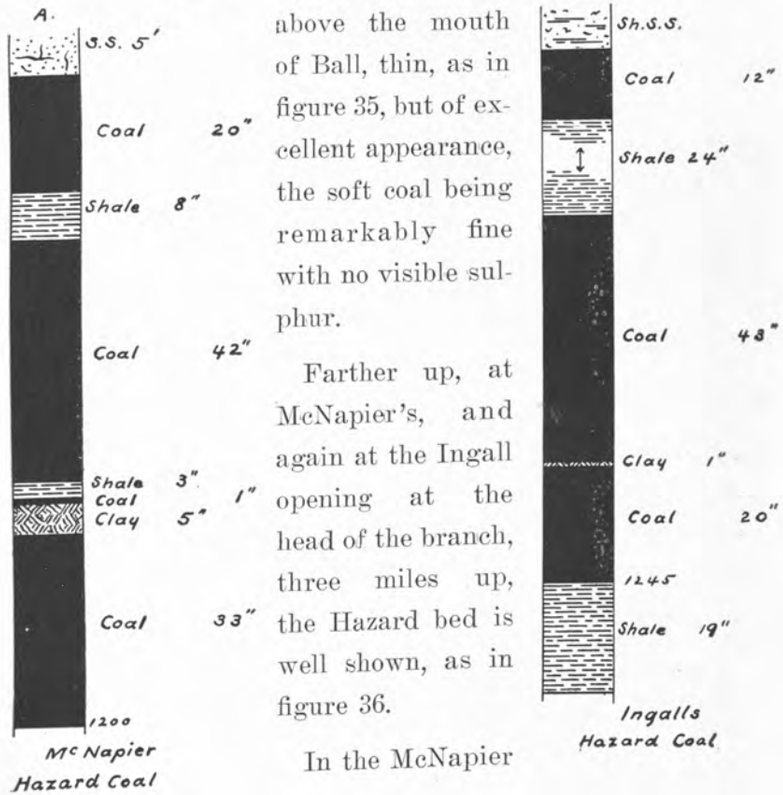


Fig. 36



BALL'S FORK.

Lick Branch.—One mile up Ball on the left.

At Lewis Holliday's, one-quarter mile up the branch, the Haddix coal is opened 230 feet above the mouth of Ball, thin, as in figure 35, but of excellent appearance, the soft coal being remarkably fine with no visible sulphur.

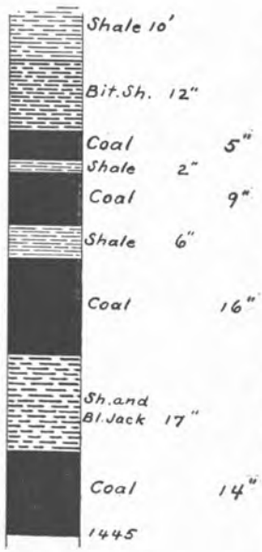
Farther up, at McNapier's, and again at the Ingall opening at the head of the branch, three miles up, the Hazard bed is well shown, as in figure 36.

In the McNapier

opening the 42 in. seam looks like a good coking coal. The bottom seam being under water and mud could not be measured, but was stated to be 3 to 3½ feet thick. The elevations given for these three openings are more than usually uncertain owing to change of barometer, with no opportunity for correction, but they are believed to be not very wide of the mark.

From Lick branch up Ball's fork to Trace fork, two miles above Laurel creek no investigation was made. Thick coal was reported, fallen in, on the head of Laurel. It is likely to continue through to the next opening noted.

Fig. 37



On the right, a mile above Trace fork, 310 feet above Ball's fork and near the top of the Trace fork ridge, Elijah Grigsby has a five-yard entry, with section shown in figure 37. The lowest parting, of shale and black-jack is indicative of the Fire-clay coal, but the bed is clearly too high for that. It appears to be of the Hazard or Flag coal, with the presumption in favor of the latter. The bench of the bed below is prominent.

The Fire-clay coal should then be 50 to 100 feet under the creek, but there is little reason to believe it a workable coal in this region.

A quarter of a mile above Grigsby's house, in the road, 50 feet above the creek, is a thin fossil limestone or lime shale on thin coal, which may serve as an aid in future correlation.

On Dry creek, below Whitesburg, a fossil limestone lies somewhat over 100 feet above the Fire-clay coal, and on Middle fork waters above Hyden, and on Red Bird creek what appears to be the same fossil limestone is known in several places, distant above the Fire-clay coal about 170 feet.

On the right three miles above Trace fork, Robert Patton has a small entry, 290 feet above the creek, with the following section.

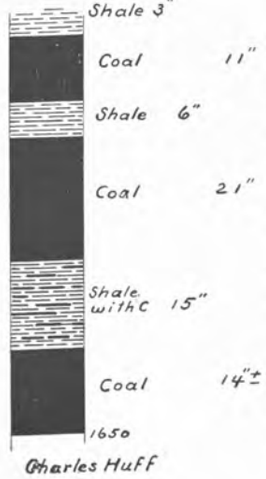
Sandstone.	
Coal	11 in.
Soft shale	5 in.
Coal	18 in.

Elevation 1480.

Possibly this is the same coal as the Grigsby coal noted just above, with the bottom seam either undiscovered or absent, but it is considered more likely that, the former being the Flag-coal, this is of the Hazard bed. The change to sandstone roof as well as the elevation is in favor of this supposition.

Wiley Fork.—At the forks of Wiley, six miles above Trace fork and one mile from the head of the creek, a bastard limestone goes below drainage, which is probably the fossil rock near Trace fork, making a slight rise of strata up stream. The Fire-clay coal, therefore, is likely to be but slightly below drainage.

Fig. 38



A quarter mile up the left fork, and on the right at Charles Huff's, 470 feet above the forks, the coal of figure 38 is opened on a good bench. The bottom was not seen owing to mud and water, but could be felt.

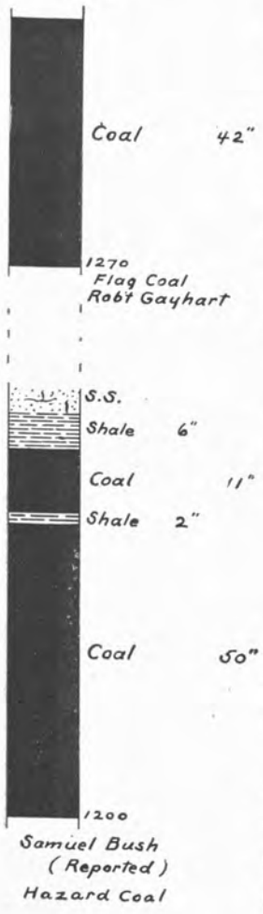
If, as supposed, the Fire-clay coal is a little below creek level at Wiley forks, this bed is the Hindman. Though its area is not great enough for extensive mining, it is not without value here. There is enough area for working the bed in the hill between the forks of Wiley, and doubtless elsewhere to a limited extent. No large body of the coal need

be expected in this region. The road gap from Wiley Right fork to Troublesome creek is about 125 feet lower. Beds lower down are likely to prove more valuable.

PIGEON-ROOST BRANCH.

This branch is on the right a mile above Ball's fork.

Fig. 39



Near its head, and consequently near to Lost and Lots creeks, the Hazard and Flag coals have been opened at 230 and 300 feet above the mouth of the branch as given in figure 39.

The Hazard bed, on Samuel Bush land, was reliably reported, as in the figure, the upper bench a block coal, the top 18 in. of the main bench a block splint (1 in. bony) separated from the block coal below by three quarter in. bony coal.

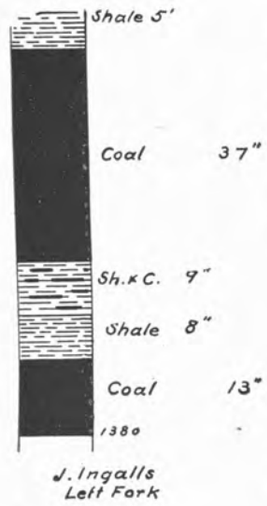
The Flag coal is on the Robert Gayheart land, a bright coal with much splint. The bed is known locally as the Gayheart coal.

COMBS BRANCH.

This branch, four miles above Balls' fork on the right, gives the main road from Troublesome creek at Dwarf P. O. to Hazard.

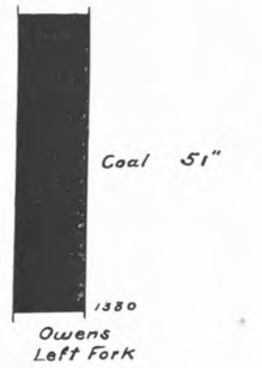
By the school house at the forks of the branch, three feet above water level is a 23 in. coal, with roof of black slate and shale under sandstone, which is probably the Fire-clay coal rider.

Fig. 40



On the left fork the Jefferson Ingalls opening, 390 feet above Troublesome creek, is as shown in figure 40. It appears to be of the Flag coal, and, toward the end of the spur from the Lots creek ridge, with but about 100 feet of covering, to have little value.

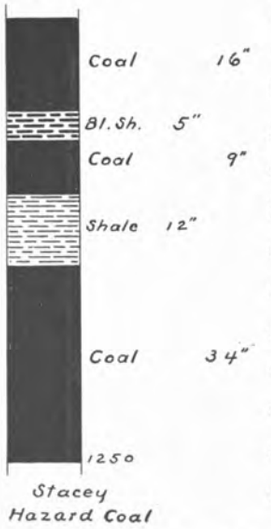
Fig. 41



By Owen's house is a coal at elevation 1270, reported two feet thick, which should answer for the Hazard coal. The opening being in the point of a hill, the full thickness of the bed here was probably not attained. A quarter mile southwest of the house the coal, figure 41, is opened, which is made (with uncertain barometer) the same elevation as the preceding Ingalls coal, and, therefore, disregarding the differing bed-sections, must be considered of the same Flag coal. Nearly 300 feet of covering gives the bed here a good area much increased as the main ridge is approached.

Near the head of the Right, or Road fork of Combs branch the Hazard coal has been opened in the old Stacy, or

Fig. 42



Henry Engle, bank, 260 feet above Troublesome creek, showing as in figure 42. The upper parting is here a soft black shale, likely to be considerably reduced under ground. The coal appears all good excepting, perhaps, two in. bony coal, two in. from the bottom of the bed, which, doubtless, has increased the ash of the following analysis, No. 2543. Both analyses give ash too high because the samples were taken from a muddy outcrop. They are Dr. R. Peter's analyses of my samples, No. 2542 of the upper two seams, No. 2543 of the bottom seam.

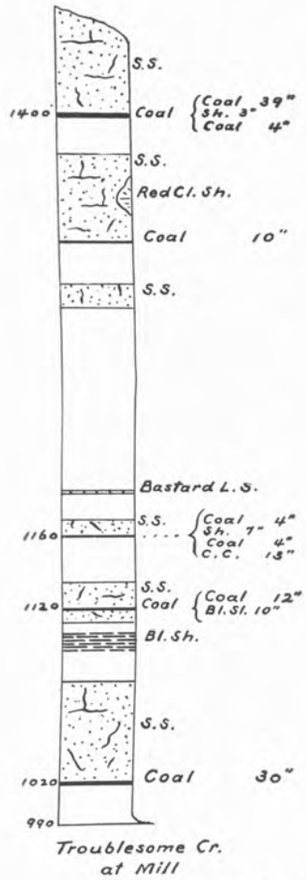
HAZARD BED.

Chem. Report Nos.	2542	2543
Moisture	1.50	3.00
Volatile combustible matter	31.56	32.80
Fixed carbon	56.54	56.14
Ash	10.40	8.06
	100.00	100.00
Sulphur	0.849	1.316
Specific gravity	1.338	1.316
Coke (light spongy)	66.94 pulverulent.	64.20
Color of ash	white	light gray-brown.

No. 2542. "A pure-looking coal generally. Portions irregularly laminated, with a little fibrous coal but no apparent pyrites between. Other portions break with irregular cuboidal fracture and shining irregular surfaces."

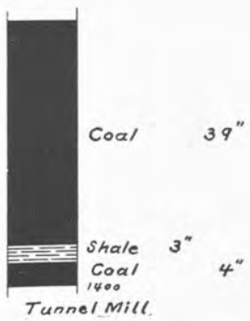
No. 2543. "A much weathered and soiled sample of what seems to be a splint coal."

Fig. 43



In the section, figure 43, the Fireclay coal rider, or one of its near neighbors, shows at the bottom; the Haddix is the Trace branch cannel coal at elevation 1160, its last appearance on Troublesome creek so far as known; the Stacy splint coal at 1260, on Combs branch, is of the Hazard bed as given above, and the top coal at 1400 is probably the Flag coal, its distance on the section from the Hazard bed being apparently increased by a rise of strata between the two points at which the openings were measured. The Flag coal here shown in figure 44 is thinner than at any of its other openings, by which it is nearly surrounded. Further development is necessary to determine if this is not an accident of opening rather than an actual thinning of the bed; but even with such thinning the bed still gives a workable coal. Though near the top of the hill where found, the cliff sandstone above it gives a quick entrance into solid coal, so that little area is lost in outcrop coal, and in receding from the main creek the covering and area increase.

Fig. 44



CLEAR CREEK.

Shop Hollow.—On the right, six miles above Ball's fork.

In this Knott county hollow, on the left, one quarter mile up Clear creek, the Flag coal of figure 45 is opened 410 feet above the creek. The upper four feet is of good bright coal, but the lower ten in. was under water when visited, and may contain a parting.

A half mile up the main creek, ten feet above it, what is probably either the Fire-clay coal, or its rider, has 26 in. solid bituminous coal with a nine in. cannel slate roof under sandstone. Some fairly good float cannel coal along the creek, supposed to come from the same bed, indicates a change of the cannel slate, to cannel coal in this vicinity. Across on Lots creek the Fire-clay coal has much good cannel. This, or a slightly higher bed goes under drainage three quarters mile farther up, at elevation 1100, with coal reported 34 in. thick, but the cannel slate may have been included.

At Josh. Ritchie's, two miles up the creek, at elevation 1390, the Flag coal is opened again, four feet of solid coal showing, and with a foot more reported underneath but covered up. A foot of shale here intervenes between the coal and sandstone above it. At the time of visiting this coal it was supposed to be of the Hazard bed, but its height and relation to other openings give stronger evidence of its being Flag coal. No conclusive evidence was available.

Big Branch.—On the right, 12 miles above Ball's fork.

Thick coal is reported about two miles up this branch, but the opening was not visited. It tends to confirm the continuation in good condition of the Flag (or Hazard) bed.

LEFT FORK.

From Hindman up the Left fork of Troublesome there seems to be no coal of much value close above drainage, but in approaching the main field of the Elkhorn bed, that coal, probably near the level of Troublesome at Hindman, becomes of interest; and there is also a favorable possibility in the Rockhouse bed below it, which gives workable coal on Carr fork and on Rockhouse creek.

On a branch from the left, two miles above Hindman there are three thin coals 20, 35 and 50 feet above the Left fork, which may possibly be the Elkhorn bed split up, though they seem to be rather high for it. The lower one of these is probably in the mill pond, a half mile farther up the fork, the middle seam showing over 18 in. coal in the road beside the pond. Fifteen feet higher is a massive sandstone over another coal.

Not correlated, but apparently about 100 feet above these seams, is the Robert Thacker entry, six miles above Hindman, ten feet above the creek and road to the head of Ball fork. The coal is 32 in. thick with massive sandstone roof, and seems most likely to be of the Fire-clay coal.

There should be at least one bed of thick coal toward the tops of the hills, which are high enough to catch the Flag coal, but it appears to have been searched for but little.

RIGHT FORK.

At Jane Childers', on the right of the creek at the upper end of Hindman, the following coals were obtained, the middle one being, probably, of the Fire-clay coal.

		Elevations.
Sandstone	5 ft.	
Shaly sandstone	8 in.	
Black shale	4 in.	
Coal	24 in.	1330
Coal and black slate		1305
Fine thin coals in shale		1260
Troublesome Creek		1075

A half mile from Hindman and a half mile up a left branch, Jasper Baker has done considerable mining for the town supply, having put into use the first aerial tramway on the upper Kentucky river waters. The mines, 460 feet above the creek, are at elevation 1540, and being 235 feet above the middle Childers coal are probably of the Hazard bed.

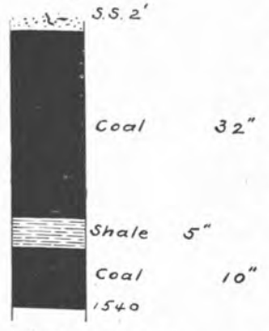


Figure 46 gives a section taken from the old mine, near its mouth. In the new mine 40 yards west of the old, barely under roof, the following section was taken:—

Sandstone drift	10 ft.
Sandstone	2 ft.
Coal	3 in.
Soft shale	4 in.
Coal	32 in.

The lower seam is a single block of fine, bright, mixed splint and block coal, and the upper seam looks nearly as good, but softer with less splint coal.

Analysis by Dr. Alfred M. Peter of my sample, including both seams of coal of the old mine gave:—

	Laboratory No. 2755.
Moisture	1.44
Volatile combustible matter	41.67
Fixed carbon	52.24
Ash (reddish brown)	4.65
	100.00
Sulphur	1.05
Phosphorus	.009
Coke (spongy)	56.89
Specific gravity	1.264
Total carbon	79.33
B. T. U. per pound of coal	14,329

"Average sample of clean-looking coal."

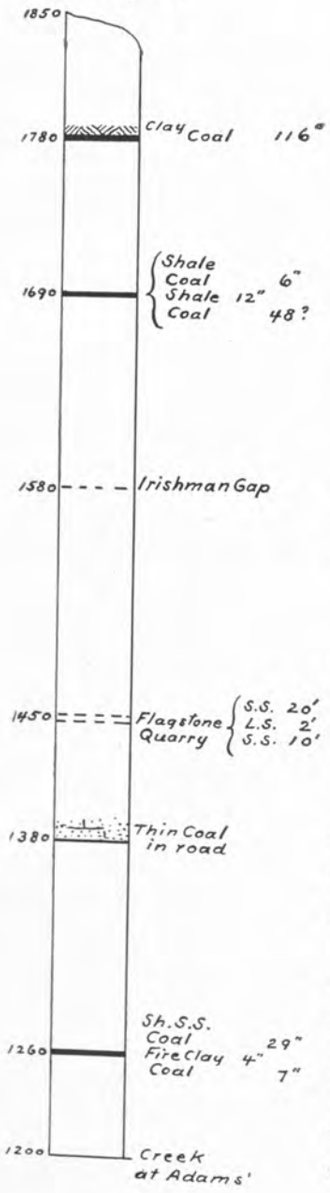
Four miles above Hindman on the road to Brannon creek, 185 feet above the creek, at elevation 1385, Wm. Pigman has an entry from which coal is hauled to town. This coal, with the following section, is possibly the same as the Childers middle coal at Hindman, probably of the Fire-clay bed, beginning in its floor to make the change to fire-clay, which shows as such parting on the Right fork road, toward Betty Troublesome.

Sandstone	3 ft.
Shale	3 ft.
Black slate	4 in.
Coal	28 in.
Hard bituminous shale.	

Coal under the present floor should be looked for.

Four miles from Hindman on the road to Betty Troublesome the section, figure 47, was taken, from the creek at R. N. Adam's to the gap to the head of Irishman creek, including, in the upper two coals, the head of the second right branch above Hindman of the Right fork of Troublesome. Being nearly on

Fig. 47



the line of strike the section is therefore correct, except for barometric inaccuracies believed to be slight.

The Adams entry, at elevation 1260, is the only known place on Troublesome creek waters where the Fire-clay coal shows its parting as the characteristic brown flint fire-clay common over most of the region where the bed appears farther south, though on Lost creek the parting is recognizable.

Possibly the next coal, 120 feet higher, slipped into the road, is the Haddix coal, but this can be surmised only, at present.

If intervals between the coals are about the same as in the Lost creek region the Hazard coal is on the level of the gap at elevation 1580.

The next coal above the gap is then the Flag coal, and it may be of considerable value, though its area in this region is confined to the tops of the ridges. The main body of coal was covered when visited, so that the thickness of the bed could be guessed at only by the depth of the opening, and its partings, if any, are unknown, but, taken in connection with the opening on Irishman creek, (p. 103), a good thickness is evident.

Fig. 48

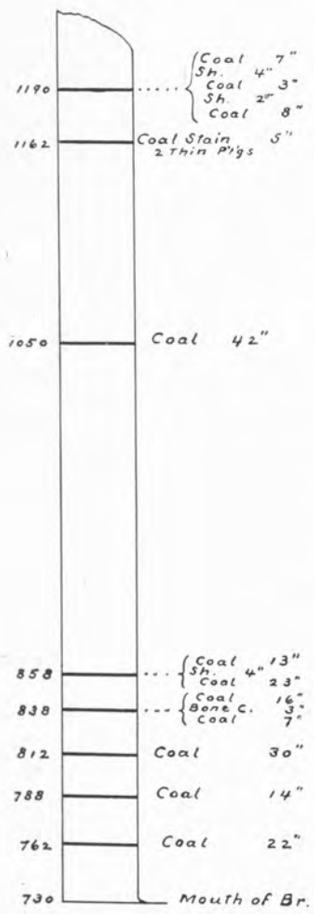
In spite of the thickness of the opening represented in figure 48, the Hindman bed in this locality, cutting only through the tops of the peaks, has areas of such narrow limits as to give it a very slight value. The opening was not in condition to measure the coal with accuracy, and its bottom was covered with water, but it can be affirmed with confidence that nowhere else on Kentucky river waters, or, probably, north of Pine mountain in the State, is there shown such a thickness of coal without parting. To the bed is therefore given the name of the nearest town, Hindman.

The openings about the mouth of Troublesome creek, in the Haddix, Hazard and Flag beds, as obtained from earlier reports, have been given at the beginning of this detailed description. No record of recent examination of this region is at hand, and through Breathitt county only old information is here repeated. Of this kind are the two cannel coal analyses following; No. 1705 from the Haddix bed above Troublesome, collected by P. N. Moore; No. 3110 from the "Joe Little bank" on the North Fork, Breathitt county, sent by Charles Hendrie.

CANNEL COAL.

Chem. Report No.	1705	3110
Moisture	1.30	0.10
Volatile combustible matter	47.00	62.42
Fixed carbon	44.40	31.48
Ash (brownish gray)	7.30	6.00
	100.00	100.00
Sulphur	1.574	.969
Specific gravity	1.265	-----
Character of coke	Dense	Dense

Fig. 49



Big Br. Section

No. 1705. "A very tough coal. It has but little fibrous coal, but some pyrites." Notes at hand do not definitely locate the coals.

BIG BRANCH.

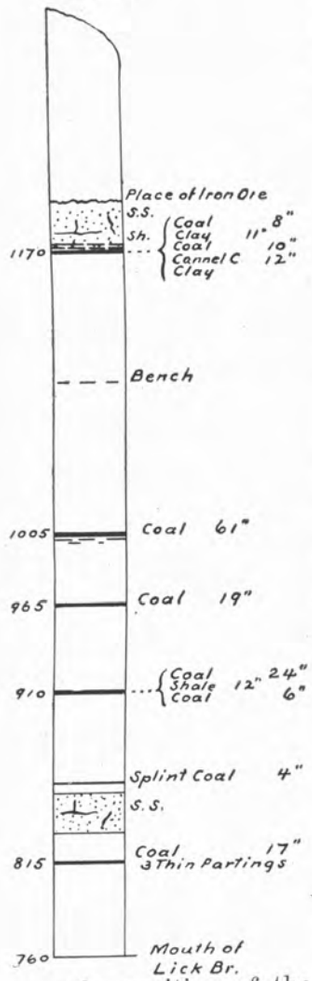
The Big Branch section, figure 49, on land of Gough & Co., shows the Fire-clay coal as one of the upper two coals of the series at the bottom of the section. Of these the upper bed appears as though it might be workable at an early date, because of its convenient height, but until it has been more thoroughly investigated it remains of uncertain value. Its workable area at best can hardly be very great, as the bed does not appear very thick elsewhere in the vicinity.

The 42 in. coal, at elevation 1050, is of the Haddix bed, the opening having been a 17-yard entry driven into the river-hill above Big Branch. At the mouth of the entry the bed is about six inches thicker than at the face, the latter as given in figure 50. The coal in being wholly bituminous, part splint coal, varies from that found in the nearby surrounding openings, which have cannel in the bottom seam. My sample of this coal from the face of the entry gave, by analysis of Dr. R. Peter:

Fig. 50

Haddix Coal
Gough & Co.

Fig. 51



HADDIX BED.	2529
Chem. Report No.	
Moisture	1.74
Volatile combustible matter	34.06
Fixed carbon	53.80
Ash (light gray)	10.40
	100.00
Sulphur	1.808
Specific gravity	1.362
Coke	Spongy

The heavy coal stain near the top of the section indicates the Hazard coal in good condition here, as elsewhere in the neighborhood. Without large area here it is still capable of profitable yield in the higher hills of the main ridge.

The Flag coal, nearer to the Hazard bed here than elsewhere, is also thinner than elsewhere in the vicinity. The lower Lost creek openings, previously given, indicate a workable area of thick coal.

LICK BRANCH.

The section, figure 51, was obtained in going nearly the length of this branch, and the lower coals do not, therefore, show correctly their distances apart, and the position of the Fire-clay coal is consequently altogether uncertain.

Fig. 52

But the upper coals were found more nearly one above the other, and there is, therefore, little reason to doubt that the Marian Spicer, 61 in. coal, figure 52, 1¼ miles up on the right fork, is of the Haddix bed, although its section differs materially from any other in the vicinity. Its elevation shows a westward dip, and indicates that the southern rise of strata east of North Fork is much reduced, or not continued west of it.

The bench above this bed marks the position of the Hazard coal, nearly, and gives opportunity here and on streams above for a deep deposit to lie as a covering on the outcrop of the bed, and prevent its accidental discovery. It is safe to assume this as a reason why the bed is little known farther up the North Fork, though unsafe to predict it of continuous workable thickness.

The Flag coal shows in the section, with its cannel, an approach to value sufficient to encourage further search, but it lies too near the hill-top to become here a very important bed.

JOHN LITTLE BRANCH.

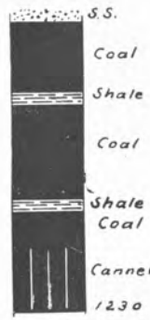
This branch is on the left two miles above Lick branch. On it the following section was obtained:

		Elevations.
Sandstone	50 ft.	
Flag coal		1230
Coal	19 in.	1185
Sandstone	5 ft.	
Coal, partly splint	24 in.	950
Shaly sandstone	10 ft.	
Black slate	4 in.	
Massive sandstone		
Coal	9 in.	920
Coal near mouth of branch		790
Mouth of branch		765

The 24 in. coal at elevation 950, found near the head of the branch some two miles up, is probably slightly below the Fire-clay coal.

The 19 in. coal at elevation 1185 is of the Hazard bed, but having been opened on a flat point of hill the normal thickness was not obtained. It should reach a thickness of over four feet to correspond with other openings in this region.

Fig. 53



The Flag coal of elevation 1230, as opened on land of Gough & Co., is shown in figure 53. Taking this in consideration, with openings of Mill and Leatherwood branches of Lost creek, a fairly remunerative field of this bed is reasonably assured, although its height is objectionable. My selected specimen of the cannel and sample of the middle seam of bituminous coal of this opening yielded, to Dr. R. Peter's analysis:—

	Chem. Report Nos. 2618	2612
FLAG COAL.	Cannel.	Bituminous.
Moisture	1.20	7.40
Volatile combustible matter	53.80	30.20
Fixed carbon	39.46	52.04
Ash	5.54	10.36
	100.00	100.00
Sulphur	0.722	0.621
Specific gravity	1.177	1.410
Coke	dense	pulverulent
Color of ash	Light brick	very light salmon

The remarkably light ash and abundant volatile matter of the cannel marks this as an unusually fine gas coal, but the small quantity of it attainable will prevent its establishment as a factor in the market.

Of the bituminous coal Dr. Peter remarks, "A weathered sample of what appears to be splint coal." The high ash of this analysis is in the main due to the mud included, which, in the imperfect opening, prevented taking for analysis any of the upper seam of coal.

GEORGES CREEK.

This stream is on the right three miles above Lick branch.

The George's Creek mines in former years were noted in Central Kentucky for the excellence of their cannel coal sent down the river in boats and on rafts, but now they are all abandoned, pending the coming of railroad facilities, and but a few outcrop openings give access to the coal

Fig. 54

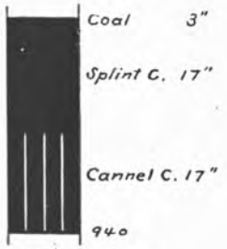


Figure 54 represents the bed a mile up, on the right, according to my measure of 1884. Mr. Hendrie's measurement, in 1891, of an opening 40 yards in gave coal 12 in., splint coal six in., cannel coal 18 in. At a 1906 opening one-fourth mile up on the left, the cannel block is 14 in. thick; at a small entry at the forks two and one half miles up, the coal above the cannel (of which the top only could be seen) is 20 in. thick. It is said to run regularly on this creek, bituminous coal about 20 in., on cannel coal 14 in. to 20 in. This is remarkable especially because of its variations on adjacent streams. The resemblance of the bed to numerous sections of the Haddix coal heretofore given, and its elevation corresponding, gives assurance that this is of the Haddix bed,

though heretofore it has been assumed to belong to the Fireclay coal, or No. 4 bed.

At the mouth of the creek the bed is 150 feet high, and it is 30 feet above drainage at the forks, giving nearly level strata. What rise up stream there is appears to be all in the upper mile, and here is probably the beginning of a long rise southward.

The following analyses of the cannel are, No. 1711, an average specimen from the stock pile, taken by P. N. Moore, No. 3109, received from Charles Hendrie, both by Dr. R. Peter, "C", sample and analysis by Prof. Thomas Egleston, Columbia College.

	Chem. Report Nos.		
CANNEL COAL	1711	3109	C.
Moisture	0.94	0.50	1.54
Volatile combustible matter	52.38	58.02	45.43
Fixed carbon	35.54	34.00	40.14
Ash	11.14	7.48	12.89
	100.00	100.00	100.00
Sulphur	1.423	1.098	1.74
Specific gravity	1.280	-----	-----
Coke	dense	friable	-----
Color of ash	light-lilac gray	gray	white

No. 1711. Dr. Peter describes this sample as, "a pure-looking coal. Has some ferruginous stain on the exterior surfaces, but no apparent pyrites."

No. 3109, "An exceedingly tough, elastic coal, compact and uniform in structure.

CANEY CREEK

Fig. 55

But one opening of importance is noted on this stream, at John Deacons, near its mouth, 145 feet above it, in a point of a hill where the full thickness probably was not obtained. The bed-section is given in figure 55. Dr. Peter's analysis of my sample of the bituminous seam (with upper 6 in. excluded because so badly weathered) and of the cannel seam, show in their ash-results that the bed was insufficiently opened. It is again the Haddix bed.

Fig. 56

Chem. Report No.	2616	2617
HADDIX BED	Bituminous	Cannel
Moisture	3.80	0.80
Voltatile combustile matter	32.30	41.70
Fixed carbon	48.80	33.30
Ash	15.10	24.20
	100.00	100.00
Sulphur	0.840	0.952
Coke	pulverulent	pulverulent
Color of ash	light reddish	light pink

No. 2616 "weathered".
No. 2617 "much weathered".

WOLF CREEK.

On Wolf creek but one opening is noted, on land of John Deacon, on the right ¾ mile from the river and 90 feet above it. Here is the finest known open-

ing in this bed, shown in figure 56. The upper seam of 61 in., is mainly splint coal, the lower, of 27 in., is a semi-cannel, showing here partly completed the change from the George's creek cannel to bituminous coal, which on Lick branch is entirely accomplished.

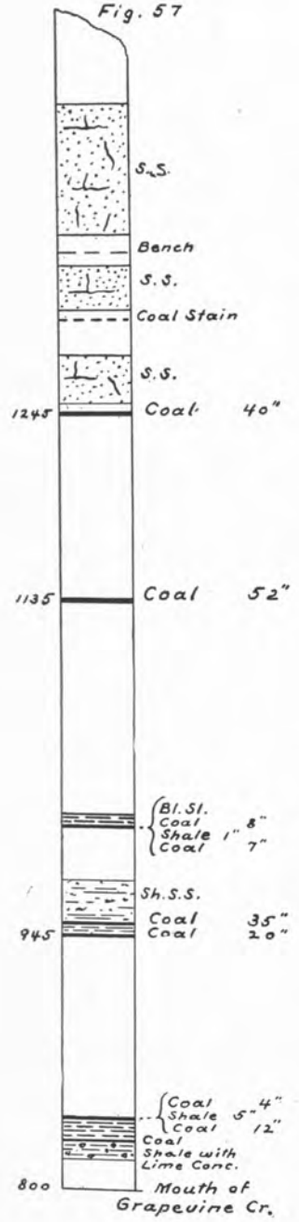
The following analyses though from samples collected at times far apart, are doubtless from the same bed on Wolf creek and probably from the same opening; No. 1713, by J. R. Procter and P. N. Moore, samples from coal badly weathered. No. 2610, my own sample, from a muddy outcrop and therefore too high in ash; both analyzed by Dr. R. Peter; "D" and "E" the two parts of the bed separately, sampled and analyzed by Prof. Thomas Egleston, Columbia College.

	Chem. Report Nos.		D	E
HADDIX BED	No. 1713	No. 2610	Upper seam	Lower seam
Moisture	2.76	2.80	4.88	1.60
Volatile combustile matter	36.68	33.60	36.83	48.72
Fixed carbon	56.50	54.20	51.41	47.59
Ash	4.06	9.40	6.88	2.09
	100.00	100.00	100.00	100.00
Sulphur	0.865	0.695	0.75	0.75
Specific gravity	1.290	1.351	------	------
Coke	light spongy	dense	------	------
Color of ash	light yellowish-gray	brownish gray	saw-dust	light brown

No. 1713. "A pure-looking soft splint coal in thin laminae, which have quite a glossy cross-fracture. Very little fibrous coal or fine granular pyrites between the laminae."

The analysis "E" from the lower seam shows the coal to resemble cannel in its high volatile constituents, and to be superior to cannel or common coals in its low ash.

Fig. 57



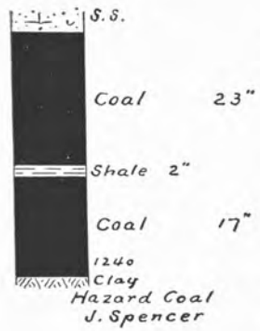
GRAPEVINE CREEK.

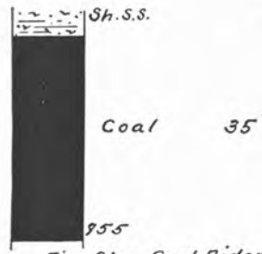
The dip up the North fork, which appears to have been constant to Wolf creek, changes its direction shortly above that stream, so that the Fire-clay coal comes above drainage probably near the Perry county line, and it is opened on the branch (called Right fork) flowing into Grapevine creek ¾ mile from its mouth. A half mile up the Left fork of Right fork, and one and one-half mile from the mouth of Grapevine, 175 feet above it, the bed has this section:—

		Elevation
Shale	8 ft.	
Coal	20 in.	
Slaty coal	6 ft.	
Flint fire-clay	3 in.	
Coal	6 in.	975

The 20-in. coal elevation 945 in the section, figure 57, is the top of the coal given above, the bottom having been discovered later; and it is possible that the 35-in. coal 10 feet higher is of the same bed at a different point, as no trace of it is now visible.

Fig. 58





Grapevine Cr.
North Fork

The higher coals of the section were found on the right fork of the Right fork, that at elevation 1,135, the Haddix bed apparently, being now opened, but partly covered, on the John Holmes place, on a large bench to the left of his house.

From a former (John Spencer) opening the lower section of figure 58 was obtained. My sample of this coal, with four in. at the top omitted, yielded to Dr. R. Peter's analysis results as given below, No. 2789.

The Hazard bed at elevation 1240 figure 58, with its abundant covering here invites further investigation. Analysis of my sample of this coal from John Spencer's, as obtained by Dr. R. Peter, is given under No. 2791.

Both of these analyses were from muddy outcrop samples.

Chem. Report Nos.	2789 F. C. Coal Rider	2791 Hazard Bed
Moisture	4.36	6.48
Volatile combustible matter	30.34	30.32
Fixed carbon	54.90	47.80
Ash (very light gray)	10.40	15.40
	100.00	100.00
Sulphur	0.450	0.491
Specific gravity	1.366	-------
Coke	friable	pulverulent

No. 2789. "Generally dull black. Fibrous coal and some little pyrites between the laminae. Some portions bright pitch-black."

No. 2791. "A somewhat weathered sample of splint coal."

Developments on the river above Grapevine creek and about the heads of Lost creek give promise for the Hazard bed of an excellent field about the heads of Grapevine, with a fair prospect for a large addition from the Haddix and Flag beds.

At Elijah Davidson's, two miles up the creek, however, what is probably the Haddix bed, at elevation 1150, gives but eight in. of rather slaty cannel coal under eight in. bituminous, with four in. clay parting.

Buck Branch.—Three miles up, on the right.

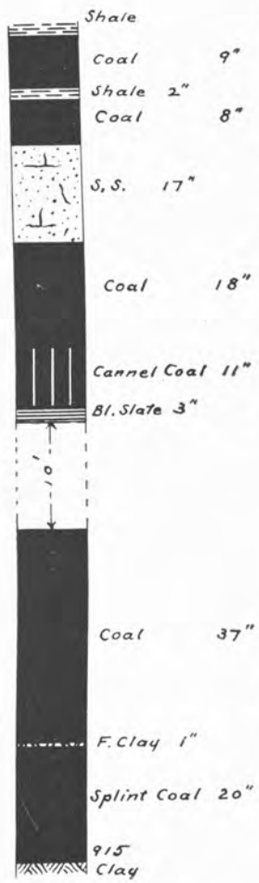
John Davidson has a small entry ¼ mile up the branch, at elevation 930, into what is either the Fire-clay coal or a near neighbor to it. The coal, with two feet shale roof under sandstone, is 33 in. thick.

EVERSOLE BRANCH.

A mile up this branch and 100 feet above its mouth an incomplete opening was made into the Fire-clay coal giving 45 in. coal above the fire-clay, supposed to be the floor of the bed. My sample of this 45 in. coal, analyzed by Dr. R. Peter, gave:

FIRE-CLAY BED.	Chem. Report No. 2788
Moisture	3.30
Volatile combustible matter	34.90
Fixed Carbon	52.20
Ash (purplish-gray)	9.60
	100.00
Sulphur	0.763
Specific gravity	1.334
Coke	dense friable

Fig. 59



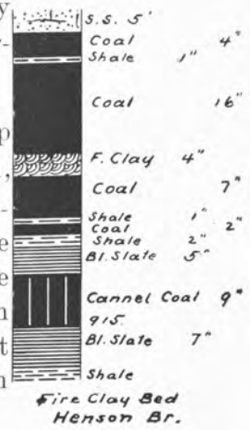
"Apparently a splint coal, somewhat weathered. Some fibrous coal between the laminae, but no apparent pyrites."

The increase in thickness of this bed here is made especially remarkable by the appearance along with it of the rider to the bed in considerable dimensions, the double bed being opened, as in figure 59, at Thomas Johnson's, 100 feet above and 1½ miles from the river. Cannel coal in the rider is a common occurrence, but a second rider over sandstone is unusual, or so distant as to be generally unnoticed.

HENSON BRANCH.

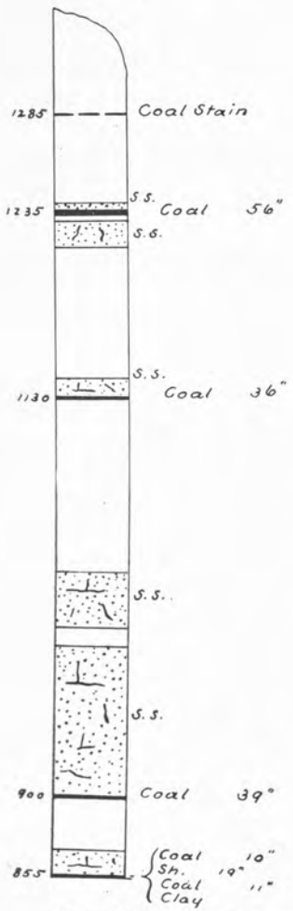
This branch is on the left about five miles above Eversole branch. The strata after rising up to and across Grapevine creek lie thence nearly level up to Willard creek, 11 miles by river above Eversole branch.

Fig. 60



A half mile up Henson branch, about 2½ miles southeast of the Grapevine Fire-clay coal opening, the same bed has been opened, 80 feet above the river, with the much broken up section shown in figure 60. Some improvement as to partings would probably result in going underground.

Fig. 61



Combined Section on Rock Lick & Fishtrap Br.

ROCK LICK BRANCH.

On the left, eight miles above Eversole branch.

The section, figure 61, shows three coals found on this branch: the Fire-clay bed at elevation 900, the Haddix 230 feet higher, and the Flag coal stain, unopened, at 1290.

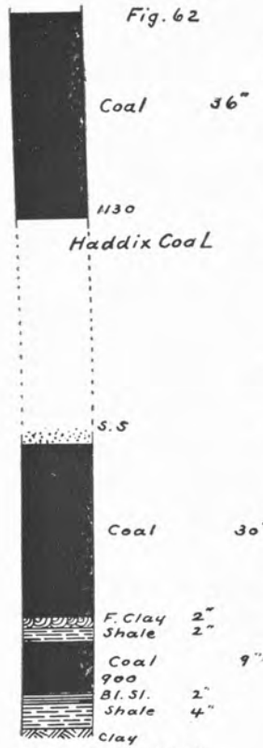
The Fire-clay coal is exposed at Joseph Campbell's, 50 feet up in a cliff by the river road, its section being given in figure 62. My sample of this coal analyzed by Dr. R. Peter gave:

FIRE-CLAY COAL. Chem. Report No. 2792

Moisture	2.80
Volatile combustible matter	29.60
Fixed carbon	58.50
Ash (purplish-gray)	9.10
	100.00
Sulphur	0.505
Coke	friable

"A weathered sample of splint coal."

Fig. 62



Fire Clay Bed

The Haddix 36-in. coal of figure 62 was measured at the mouth of a 20-yard entry. At the face it was but 30 in. thick, and the general condition of the bed is not so favorable as to lead to expectation of recovery farther under, but the coal is too valuable to warrant the neglect of additional exploration.

A half mile above Rock Lick branch and across the river at John Napier's, an 8-yard entry into the Fire-clay coal gives:

Elevation 900; 50 ft. above river.

Sandstone	5 ft.
Coal	25 in.
Flint fire-clay	5 in.
Coal	10 in.

An inch of shale in the bottom coal at the mouth has disappeared at the face.

Fig. 63

Hazard Coal

FISH-TRAP BRANCH.

On the left, one mile above Rock Lick branch.

At Abner Campbell's, ¾ mile up this branch, is the 56-in. coal shown at elevation 1235 in the section, figure 61, its relation to other coals there determining it to be of the Hazard bed. It is given on enlarged scale in figure 63. My sample gave to Dr. R. Peter's analysis, the following results:

HAZARD BED.	Chem. Report No. 2787
Moisture	5.26
Volatile combustible matter	30.34
Fixed carbon	55.20
Ash (light purplish-gray)	9.20
	100.00
Sulphur	0.475
Specific gravity	1.359
Coke	friable

"Some portions dull, like cannel coal; others bright. Some fibrous coal between the laminae, but no apparent pyrites."

WILLARD CREEK.

On Willard creek near its mouth the Fire-clay coal bed gives the following section:—

Elevation 925; 70 ft. above river	
Sandstone	5 ft.
Shale	5 ft.
Coal	2 in.
Fire-clay	4 in.
Coal	10 in.
Clay	4 in.
Black slate	3 in.
Clay	

A half mile up the creek to the first left branch and a half mile up the latter, the Haddix coal has been opened, at elevation 1130, between two prominent cliffs, the upper one showing at intervals to a height of 70 feet above the coal, reported here, but not now visible, 3 feet thick, the top 2 in. cannel coal. The opening indicated somewhat less coal.

One hundred feet higher, 375 feet above the river, Roderick McIntosh has opened the Hazard bed with 57 in. solid coal, figure 64. The foot of bony coal appears to be fairly good, and the whole bed should be readily marketable.

Fig. 64

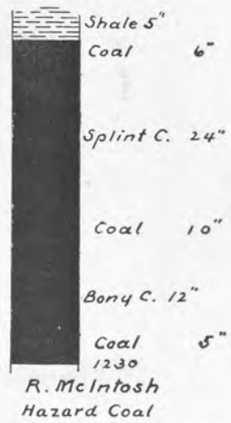
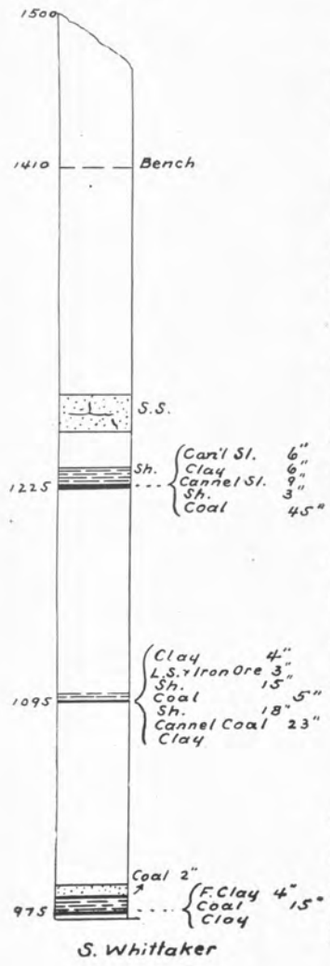


Fig. 65



In the section, figure 65, taken at Samuel Whittaker's, on the left fork of the Right Fork of Willard, two and one-half miles from the river, the upper bench of the Fire-clay coal bed is lacking, but the lower bench is given in the 15 in. coal under Fire-clay at elevation 975. Both benches of coal and the Fire-clay are well-nigh gone across on Hell-for-Certain and Bull creeks.

The rather slaty cannel coal at elevation 1095 is probably of the Haddix bed, though its roof is not the usual sandstone; and its interval to the Fire-clay coal is too small, possibly because of barometric variation.

Much of this error, if such it is, is eliminated on reaching the Hazard bed, at 1225. This coal as found at an opening a mile above Whittaker's, at the head of the fork, is given in figure 65,

Fig. 66

and another opening into the same bed at Whittaker's is shown in figure 66. This latter opening was not carried far enough for more than an approximate measure of coal and coverings, nor was that of figure 65 carried so far that my sample obtained from it was not injured by the adherence of mud. The following analysis, by Dr. R. Peter, serves to show this in its undue proportion of ash.

HAZARD BED. Chem. Report No. 2794

Moisture	3.96
Volatile combustible matter	32.84
Fixed carbon	52.80
Ash (purplish-gray)	10.40
	100.00
Sulphur	0.722
Specific gravity	1.390
Coke	friable

"Portions of the sample dull splint coal. Some fibrous coal between the laminae, but no apparent pyrites. Some pieces bright pitch black."

On the bench 185 feet above the upper coal of figure 65, elevation 1410, is a coal reported thick, probably correctly, as it corresponds with the height of the Hindman bed, opened little more than a mile southwest on Big Creek.

PIGEON ROOST BRANCH.

On the left one mile above Willard creek.

The Haddix coal was opened one mile up from, and 265 feet above, the river, with but 2 in. shale roof under sandstone

the coal 32 in. thick, half splint coal, corresponding with that on Rock Lick branch: it is at the same level and not far distant.

Fig. 67

Only 60 feet (by barometer) above the last opening the Hazard coal, figure 67, was partly opened, showing 60 in. coal of which about half was splint. A few more inches might, perhaps, have been found by more digging, but the amount obtained was sufficient for identification, and to prove the continuation of this valuable coal.

At Albert Hoskins' on the right of the river, one quarter mile above Lower Second creek, the following section was obtained:—

Hill-top	1350
Coal, 6 ft	1250
Main bench	1190
Coal, reported 3 ft	1160
Bench	1070
River	870

The Fire-clay coal is probably at elevation about 950. The reported three feet coal is of the Haddix bed, though its three feet shale roof is unusual. The six feet coal with five feet shale roof is then of the Hazard bed, corresponding with the McIntosh coal of Willard creek. This opening is a small entry, and with a foot of water in it, no measurement taken. The visible coal between the timbers appeared to be about five feet thick without parting, but near the bottom of the bed is four in. of very poor bone coal. The height of the hill indicates that it is necessary to go back from the river to get good area.

BIG CREEK.

Fig 68

Near the top of the hill on the road from Big creek to Hazard, Win. Combs has made several entries into the Hazard bed, 315 feet above the Fire-clay coal by the road, where the latter is 100 feet above the river at Hazard. The coal is a bright nearly uniform block coal, showing as in figure 68, and with no material variation in thickness or quality in the one small mine now accessible. With little more than 100 feet of covering the area of the coal in this vicinity, though not large, is sufficient to invite early working, because of its easy delivery to the river valley.

The stain of the Flag coal shows on a very conspicuous bench by the Combs house, 60 feet above the mine. The gap to the river north of the house is but 50 feet higher. Sandstones in cliffs are above and below both beds.

On the central fork the Hazard bed is still thicker than found on the Left fork and has a heavier covering, but a parting detracts from its value.

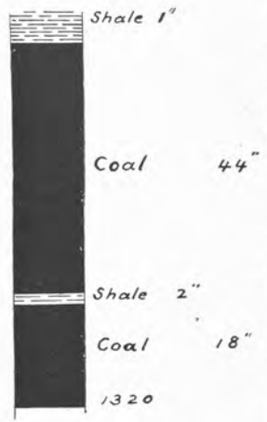
At Alfred Eversole's, three miles from the mouth of Big creek, where the Fire-clay coal is probably about 20 feet below drainage, the Hazard bed lies 280 feet above the creek, and measured:—

Soft coal	19 in.
Splint coal	24 in.
Soft coal	3 in.
Parting	10 in.
Coal	16 in.

But as the bottom 26 in. was under water, and the floor level somewhat indefinite, the lower measures are inaccurate. The top seam by itself makes a handsome appearance.

Forty feet higher is the Flag coal, containing cannel, but it appears never to have been opened.

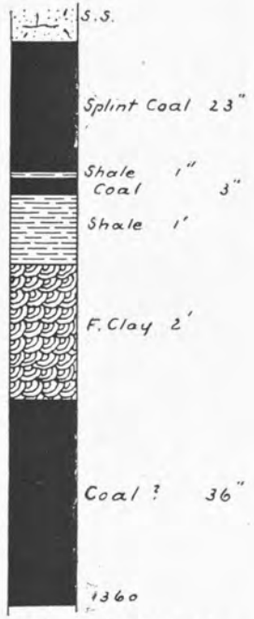
Fig. 69



Another opening of Alfred Eversole's into the Hazard bed is shown in figure 69. It is a mile to the left of Left fork, up Jenny Lick branch, and is about level with the preceding two Hazard bed openings.

Again, some two miles above Eversole's near the head of the fork, the Hazard bed is opened, showing as in figure 70.

Fig 70

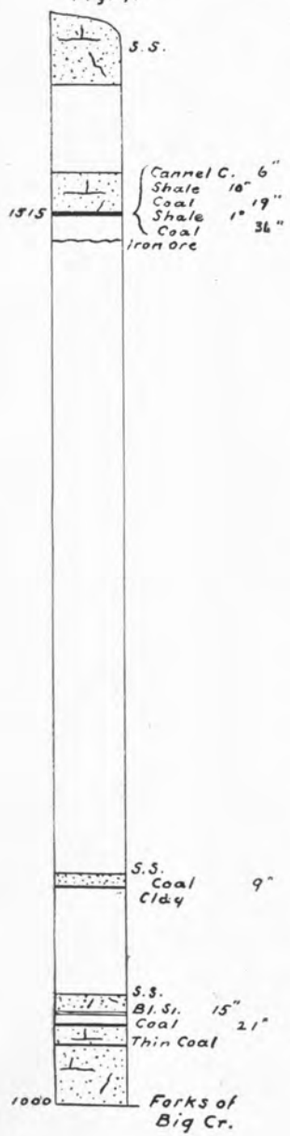


The top 19 in. of the first Eversole opening is entirely gone, but the remainder of that seam is unchanged except for the intrusion of an inch of shale. The heavy parting below, if it continues, will forbid the working of the upper seam, but some compensation lies in the thickening of the under seam. But the lower half of this having been measured under water, it possibly may not be clean coal.

The hill here is high and at an elevation of 1660, the Hindman coking (?) coal bed appears, five to six feet thick, probably without material parting. Though the peaks here rise 300 to 400 feet

above the coal the gaps cut deep and the area of this bed is not large enough to make it a very important factor.

Fig. 71

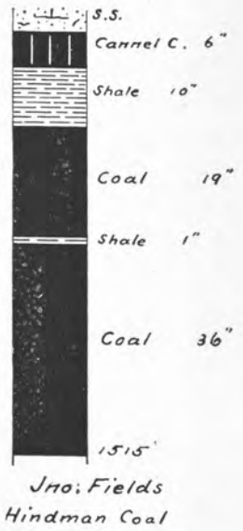


On the Right fork the bottom coal of the section, figure 71, is probably of the Fire-clay coal bed, the fire-clay, not noted here, being visible where it goes below drainage near the head of the fork on the road to Mackintosh creek. The bed here also, where dug from the creek, is thin, though having about one foot of coal below the parting.

The 21 in. coal of the section, 15 feet higher, becomes 32 in. including two thin partings, and continues, under a black slate roof, in the cliff just above the Fire-clay coal digging in the creek. As the rider to the Fire-clay bed it becomes important south of Hyden.

The top bed of the section shown in detail in figure 72, is of the Hindman bed, 480 feet above the Fire-clay coal. It has here a rider of cannel coal, not known to it elsewhere. The ridges here are still too low and narrow to furnish any very great amount of coal from this bed, yet they are long enough to warrant

Fig. 72



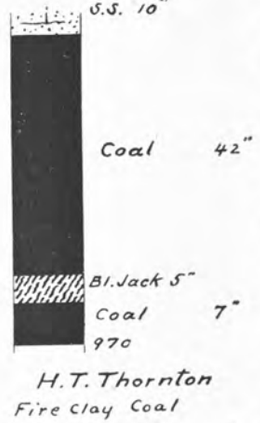
working the bed, when transportation facilities are supplied to the lower beds.

From the imperfect opening made Mr. James I. Profitt sampled for the Survey the lower 36 in. of coal, which, analyzed by Dr. R. Peter, gave:—

HINDMAN BED. Chem. Report No. 2783	
Moisture	3.50
Volatile combustible matter	35.30
Fixed carbon	53.14
Ash (light brownish-gray)	8.06
	100.00
Sulphur	1.035
Specific gravity	1.333
Coke	dense.

"A weathered sample of splint coal. Some fibrous coal between the thin laminae, but no appearance of pyrites. Some ferruginous incrustation."

Fig. 73



A half mile above Big creek, on the right of the river, 85 feet above it, the section of figure 73 was obtained, at the mouth of H. T. Thornton's 20-yard entry. This is the first opening into the Fire-clay coal bed on the river above Willard creek to give a workable coal. The black-jack parting, similar to the "jack-rock" of the Middlesboro region, takes the place of the usual flint fire-clay. Of rare occurrence in the central part of the Kentucky river field, this characteristic is found on Lost creek and elsewhere near the rim of the field, and is common towards the heads of Middle Fork and on Red Bird creek.

PEACH-ORCHARD BRANCH.

On the left one mile above Big Creek.

At the head of this branch, 415 feet above the river, on land of Nancy Combs heirs, the Flag coal gives the section shown in figure 74, the bottom 6 in. measured in water at the mouth of a four-yard entry. Though high on the hill there is still enough area to yield large returns if the very favorable condition of the bed continues through to Lost creek, as the openings there indicate.

Fig. 74

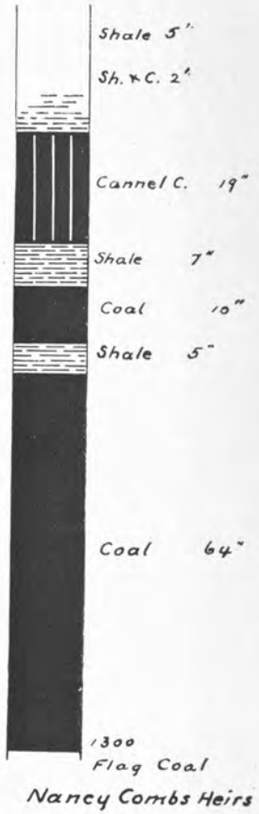
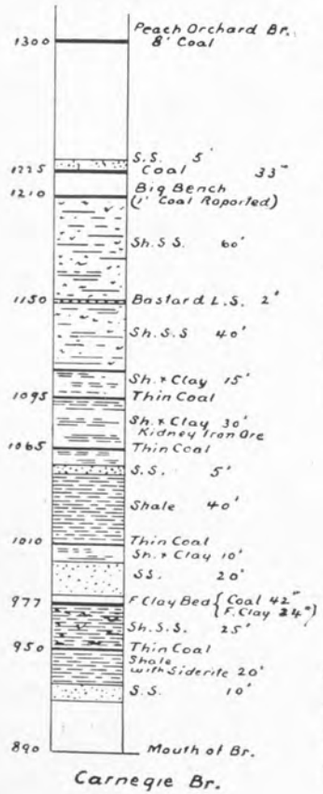


Fig. 75

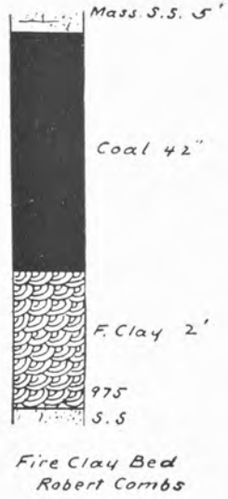


CARNEGIE BRANCH.

On the left, two miles above Big creek, three miles below Lots creek.

The section, figure 75, represents the strata as exposed along the road up the spur on the east to the head of the branch, with the Fire-clay coal at the branch and the Flag coal of Peach Orchard branch (a half mile west of the Hazard opening) included.

Fig. 76



The Fire-clay coal, 85 feet above the river, a quarter mile up the branch, opened to a five-yard entry by Robert Combs, has here no parting, but shows 42 in. clean coal as in figure 76. The fire-clay under the coal, where the parting not infrequently lies gives no flinty characteristic, and is clearly the floor of the bed. Nor can this be the rider of the bed as the same coal is found close above on the river with the fire-clay parting. Its absence is also noted on Lots creek. This is especially remarkable as its presence is so usual as to have been regarded as even more constant than the coal itself.

An earlier measure of the bed, when belonging to Alexander Combs, gave but 39 in. coal, probably at the mouth of the present entry. My sample taken then was analyzed by Dr. R. Peter with the following results:—

FIRE-CLAY COAL. Chem. Report No. 2793	
Moisture	1.76
Volatile combustible matter	36.04
Fixed carbon	56.20
Ash (very light gray)	6.00
	100.00
Sulphur	0.557
Specific gravity	1.290
Coke	light spongy

"Apparently good splint or semi-bituminous coal. No apparent pyrites."

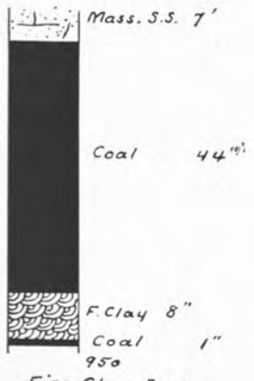
The 33 in. coal, at elevation 1225, figure 75, 335 feet above

the river, owned by Thomas B. Combs, is of the Hazard bed. With about five feet of coal in this bed at numerous points, north, west and south of this opening, the bed does not give here the thickness which should be expected for this immediate locality. Other openings are needed before this can be accepted as representative here.

The upper coal of the section is described as found on Peach Orchard branch, page 88.

From 90 to 110 feet above the river are scattered conglomerate pebbles in some quantity, which appear to have come from the friable sandstone on which they lie, but none were discovered imbedded in it here or elsewhere on this horizon where the pebbles were found. Their occurrence at a height of 10 to 100 feet above the Fire-clay coal bed is infrequent, and seems to be confined mainly to the close vicinity of the North fork.

Fig. 77



At one and one quarter miles below Lots creek, north of the river and 50 feet above it, are several old mines belonging to Elhannon Crawford, from one of which the section, figure 77, was obtained. The fire-clay parting is here bituminous and not flint, and the 1 in. coal below it signifies that on Carnegie branch the parting has run into the floor.

On the road up Meadow branch (a mile below Lots creek) toward Sixteen-Mile creek the following section was taken to aid in locating the source of theconglomerate pebbles.

Conglomerate pebbles (abundant)	1055
Conglomerate pebbles on level by house	990
Coal stain (on sandstone)	970
Fire-clay coal at spring (river road)	950
River	900

The chief source here appears to be about 100 feet above the Fire-clay coal bed, though on Carnegie branch they appear but 20 to 40 feet above it.

LOTS CREEK.

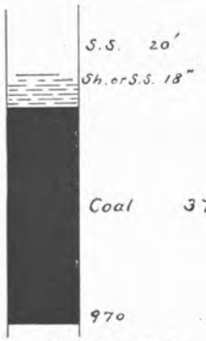
By the road one quarter mile up this creek, 50 feet above it, an opening into what is presumably the Fire-clay coal bed shows 35 in. coal, with possibly an inch or two more at the bottom covered. The seam of coal below the fire-clay parting is probably lacking. The roof is here a shale changing to shaly sandstone, the whole eight feet thick, with five feet visible sandstone above.

Dark Fork, or Helen Combs Branch.—On the left, three quarters mile up the creek.

On the right of the branch, one eighth mile up it, 60 feet above the creek, the old Fielding Combs opening, (now S. M. Napier), gives the section of figure 78. The coal is bright and looks rich in bitumen, a part of it seeming to be nearly cannel coal, but the analysis does not indicate it.

My sample, analyzed by Dr. R. Peter, yielded:—

Fig. 78



FIRE-CLAY COAL. Chem. Report No. 2541

Moisture	5.20
Volatile combustible matter	31.86
Fixed carbon	52.94
Ash (very light buff)	10.00
	100.00
Sulphur	0.588
Specific gravity	1.570
Coke	pulverulent

Trace Fork.—On the left one mile up.

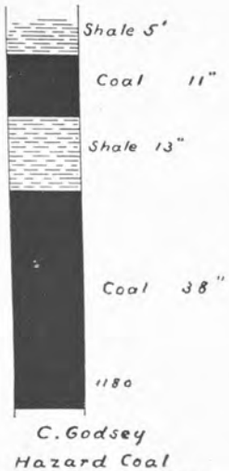
A mile up the fork behind the Holliday school-house, 10 feet above the creek, the Fire-clay coal, (or its rider) is opened in a small entry giving the section, figure 79.

Fig 79

Fig 80

Three miles up the fork, toward Lost creek, at the head of a branch on the right, Riley Gayheart had opened the Flag coal, as in figure 80, part of it a good splint coal, and the rest attractive in appearance. The Robert Gayheart openings into the same bed on Pigeon Roost and Combs branches of Troublesome and the openings at the head of Lost creek, all indicate that a minimum of not less than four feet of coal may be expected in this region. The chief question here regarding the coal must be in relation to its area, of which there is certainly a considerable amount.

Fig. 81



Two miles up the fork in a field on the left of the road to Troublesome, Charles Godsey land, the Hazard bed gave the section of figure 81. Openings into this bed surrounding the ridge at the head of Lost creek assure a fine working field, perhaps to become one of the most profitable of any of the Kentucky river, though in its extent of thick coal the bed gives excellent promise in other localities.

On the Right fork, or main Lots creek, from one to two and one half miles above Trace fork, a line of openings ten to 30 feet above the creek gives the relation of the Fire-clay bed to its rider here. Figure 82 gives the principal ones at distances about one half mile apart.

Probably nowhere else, but on Carr fork does the Fire-clay coal give thicker cannel combined with enough bituminous coal to make mining easy, but it is not likely that this condition extends far beyond the limits developed. On Combs branch, Troublesome creek, the bed is too thin to work; farther up on Lots creek it is thin or unopened, and along the river above and below Hazard the cannel is changed to bituminous coal while the rider is missing altogether. My sample of the B. F. Grigsby cannel, analyzed by Dr. R. Peter, gave:—

FIRE-CLAY CANNEL. Chem. Report No. 2540

Moisture	0.44
Volatile combustible matter	44.16
Fixed carbon	49.40
Ash (light gray-brown)	6.00
	100.00
Sulphur	0.766
Specific gravity	1.250
Coke	dense spongy

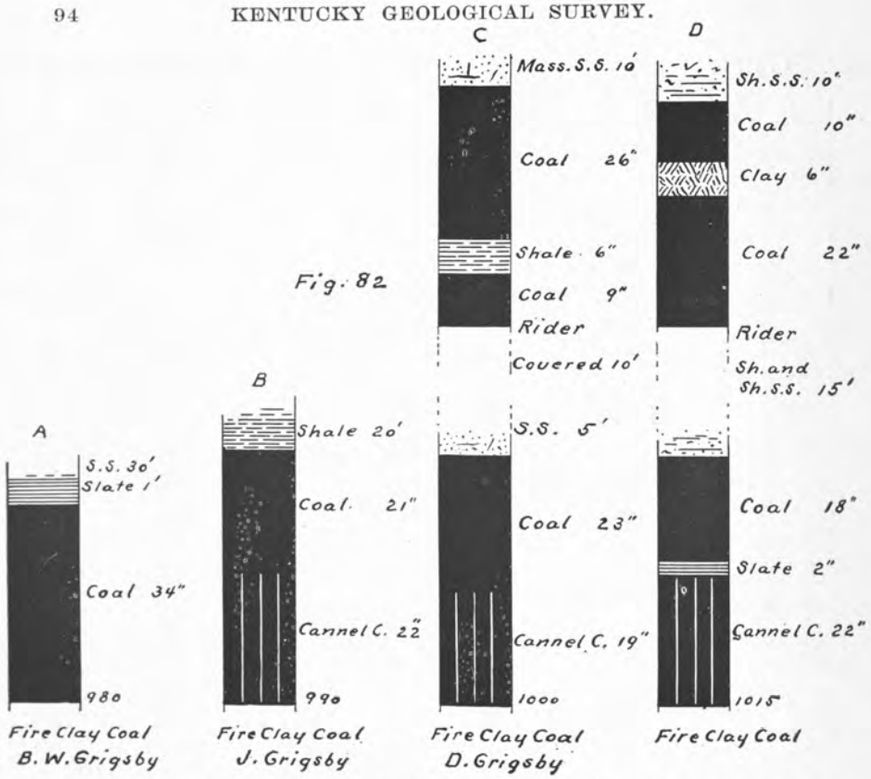
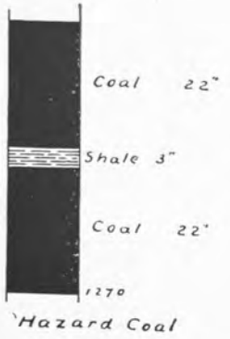


Fig. 82

"A pure-looking cannel coal. Tough. Fracture very broad, irregular conchoidal." The weight of ash makes it a remarkable cannel.

It needs be said of these openings that there is no conclusive evidence that the upper bed, instead of the lower, may not be the Fire-clay coal. It is assumed otherwise from the fact that the main bed, not infrequently part cannel, often has such a rider as here, while nowhere is a workable bed below the Fire-clay coal known to approach so near.

Fig. 83



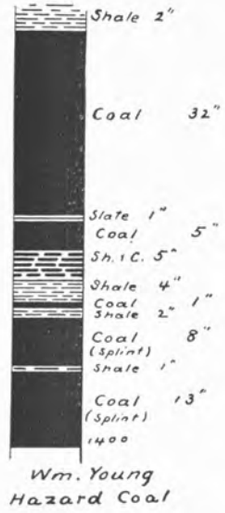
Above this cannel, at elevation 1300, and 285 feet above the creek, the Hazard bed has the section of the coal of figure 83. Here the ridge is high enough to give a good working area.

At the height of 1470 feet an opening giving 18 in. coal with two 12 in. partings is probably representative of the Flag coal; but further development is needed to establish the values of the higher coals of this vicinity.

Elk Lick Fork.—On the right, three and one-half miles above Trace fork.

Fig. 84

Fig. 85



At elevation 1025, fifteen feet above the mouth, an old opening probably into the Fire-clay coal rider, developed somewhat under three feet of coal with 20 feet of shale and sandstone above it and 20 feet of sandstone exposed over that.

On the upper right fork, on the Sylvester Grisby tract, (now Va. I. C. & C. Co.) the Hazard bed (probably) with 54 in. of clean coal, as in figure 84, has a fine appearance, with a considerable proportion of good splint coal and no pyrites visible. Its apparent height of perhaps 380 feet above the Fire-clay coal at the mouth of the fork instead of the usual 300 feet, is in part due to the rise of strata along the fork, easily amounting to 60 feet.

On what is by the U. S. topographical map the upper Elk Lick fork in Knott county, a mile from the road to Mill creek, on William Young's land, now Slemp Coal Co., 20 feet above the creek, the section of figure 85 is opened. No other coals having been seen in the vicinity correlation is uncertain, but there is little reason to doubt that it is in the

Hazard bed. It is also probable that in going underground a much more satisfactory face of coal as to partings could be obtained, and especially is it likely that the splint coal of the two bottom seams would combine into one solid block.

Fig. 86

WALKER BRANCH.

On the left one mile above Lots creek.

Of the half dozen entries, one quarter to one half mile up this branch, ten to 20 feet above it, that one given in figure 86 alone was in condition for measurement of the upper coal seam. The flint fire-clay was unmistakable, and the bottom coal was found under the fire-clay and both these had been left undisturbed in mining.

Fig. 87

A. H. Turner has a 20-yard entry by the road a half mile below Hazard, 60 feet above the river, from which the section of figure 87 was obtained. As on Walker branch the flint clay parting clearly defines this as of the Fire-clay coal bed.

Across the river from the last opening, 100 feet above it (more or less) on land of J. H. Combs, an old opening into the upper seam of the same bed, given as three feet thick, was sampled by Prof. A. R. Crandall, and three years later, measuring 33 in., by myself. The two samples, analyzed by Dr. R. Peter, gave the following results: —

	Chem. Report Nos.	
FIRE-CLAY COAL.	2398	2546
Moisture	1.50	1.50
Volatile combustible matter	36.10	33.50
Fixed carbon	59.06	61.20
Ash (light gray)	3.34	3.80
	100.00	100.00
Sulphur	0.618	0.794
Specific gravity	1.272	1.287
Coke	spongy	light spongy

Dr Peter remarks of the first sample, "A pure-looking pitch-black splint coal. Shows very little fibrous coal and no visible pyrites between its irregular laminae." Of the other practically the same is said.

In the town of Hazard, about 30 feet above the river an old entry, of which no record is at hand, was made into a coal-bed 75 feet under the Fire-clay coal. The same coal is exposed 15 feet above the river, in a cliff by the road above Hazard, where the following section obtains:—

Sandstone	20 ft.	
Coal	35 in.	
Flint fire-clay	7 in.	
Coal	3 in.	1015
Clay		
Sandstone	60 ft.	
Shale	5 ft.	
Black slate	5 ft.	
Coal and 12 partings	40 in.	940
River		925

This lower bed with its many partings is of no value here, and little elsewhere so far as known, except in a considerable region about Whitesburg. To it is therefore given the name of the Whitesburg Coal bed. The bed can often be identified by its heavy black slate roof, which appears to accompany the coal throughout most of the North and Middle fork areas.

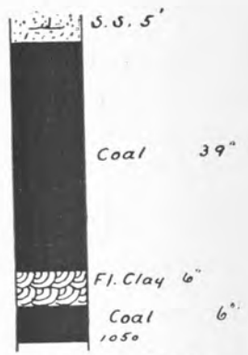
The Fire-clay coal, at elevation 1015, is opened in a small entry with chute to the river road.

BUFFALO CREEK.

On the right, three miles above Hazard.

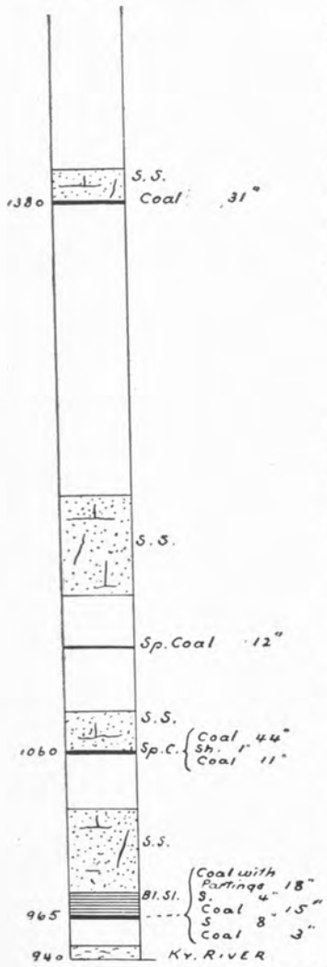
By the creek, a mile up it, at Alfred Eversole's, the Fire-clay coal is opened 90 feet above the river, as shown in figure 88. In two measurements taken three years apart, the openings having been worked slightly meantime, the upper coal seam had decreased three in., and the lower increased two in.

Fig. 88



Fire Clay Bed
A. Eversole

Fig. 89



Section at E. Cornetts

The section of figure 89 was taken at Elijah Cornett's, opposite and above the mouth of Buffalo creek. The Whitesburg coal at elevation 965, though gaining thickness, is still valueless.

The Fire-clay coal at elevation 1060 with its large proportion of splint coal and its thin shale parting in place of Fire-clay as shown in figure 90, presents an unusually fine section for this bed, but the mine appears now to be abandoned.

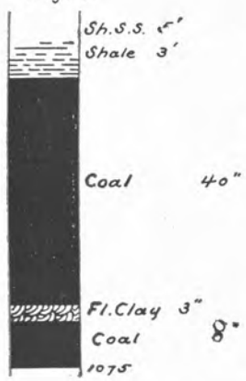
Fig. 90

Fire Clay Bed
E. Cornett

The 31 in. coal, at the top of the Cornett section, appears about at the level of the Hazard coal, but more data are required to determine this with certainty. My sample of this coal gave to Dr. R. Peter's analysis:—

	Chem. Report No. 2544
Moisture	4.50
Volatile combustible matter	32.50
Fixed carbon	57.50
Ash (nearly white)	5.50
	100.00
Sulphur	0.670
Specific gravity	1.381
Coke	pulverulent

Fig. 91



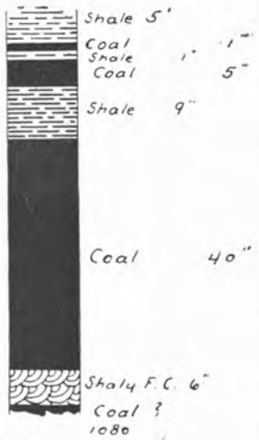
Fire Clay Bed
Van B. Combs

"A somewhat weathered sample of splint coal. Some fibrous coal, but no pyrites apparent between the laminae.

By the road, four and one half miles above Hazard, Van Buren Combs has a 30-yard entry, 85 feet above the river, in which the parting has returned again to fire-clay, the bed showing the section of figure 91.

Below the road, five miles above Hazard, Martha Stacy has two entries, 100 feet above the river, driven at nearly a right angle to one another. Water in them prevented seeing the floor, but the fire-clay parting, shaly here, was meas-

Fig. 92



Fire Clay Bed
M. Stacey

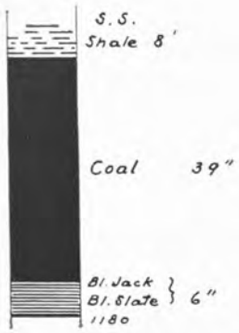
ured with the coal above it, both as shown in figure 92.

The foregoing openings from Hazard up prove the presence of a fine field of the Fire-clay coal, which extends up to and beyond Sassafras creek, Carr fork.

CARR FORK.

Scattered along the road opposite the mouth of Carr fork, probably 30 feet below the level of the Fire-clay coal, are many pebbles which seem to have come from a friable sandstone in place there, but, as below Lots creek none were found in the rock itself. They were reported seen also in the cliff above the road below Carr fork, in former years, probably above the level of the Fire-clay coal, but their location could not be closely described.

Fig. 93



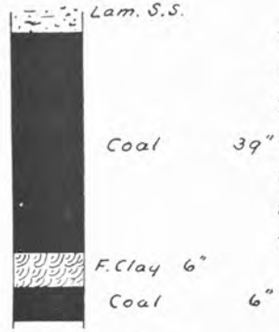
Fire Clay Bed
Georges Br.

Georges Branch.—On the right, four miles or more up Carr fork.

On the left, one quarter mile up the branch and 170 feet above its mouth an entry has been made into the upper seam of the Fire-clay coal, figure 93. The coal here seems to differ from that of the bed generally, and is apparently coking coal. The floor of the entry, or parting perhaps consists of 4 in: 6 in. of black-jack and black slate, representing the fire-clay

parting. An unusual quantity of huge, rough, hard boulders lie about the place, having come from a short distance higher up.

Fig. 94

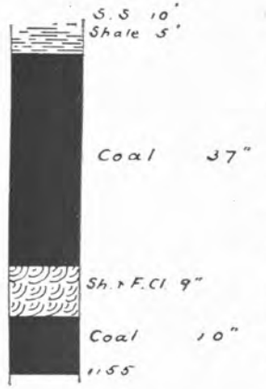


Fire Clay Bed
Forks of George's Br.

At the forks one and one half miles up the branch, ten feet above it, in a rockhouse, the same bed shows as in figure 94, with the parting a true flint clay, and the under seam present. The section accords with that on Big branch across the ridge to the south. The elevation was not taken.

Rowdie Branch.—On the right, in Knott county, one mile above Yellow creek.

Fig. 95



Fire Clay Bed
Rowdie Br.

Harmon Stacy has an 8-yard entry into the Fire-clay coal, ¼ mile up the branch, 130 feet above its mouth, represented in figure 95. The upper seam, varying from 34 in. to 37 in. coal, is thinner than the openings on either side of it would lead one to expect, and other openings in the close vicinity should prove better. The parting of dark flint fire-clay, over slate like that of George's branch, confirms the statement that the floor of the latter opening is the usual parting.

At the mouth of Sassafras creek Esq. Cornett's coal, reported by Prof. A. R. Crandall as in figure 96, is probably of the Fire-clay coal bed, but its height not being given, this must be conjectural. The bed should lie about 170 feet above Carr fork, as on Rowdie branch. The bone coal may represent the

fire-clay parting, but an undiscovered seam of coal below the floor is not improbable.

Prof. Crandall's sample, analyzed by Dr. R. Peter, yielded:

Fig. 96

Chem. Report No.	2399
Moisture	1.30
Volatile combustible matter	34.70
Fixed carbon	56.10
Ash (buff-gray)	7.90
	100.00
Sulphur	0.437
Specific gravity	1.305
Coke	Spongy

"Generally a bright splint coal. No apparent pyrites and very little fibrous coal between its laminae.———The apparent ash percentage———is no doubt increased by the adherent dirt in the sample."

Fig. 97

Irishman Creek.—By the schoolhouse at the mouth of this creek, 150 feet above it, the Fire-clay coal is opened as in figure 97, the main part ing being a true flint clay. The bed is opened, as previously stated, at elevation 1260 on the right fork of Trouble some, and the course of Irishman creek, heading near that opening, is about on the line of strike of strata, so that a very favorable opportunity is afforded to obtain the intervals to the high beds about the head of the creek. From the Fire-clay coal to the Hindman bed is about 530 feet.

Fig. 98

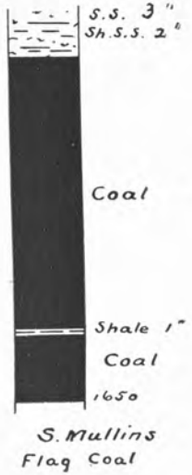
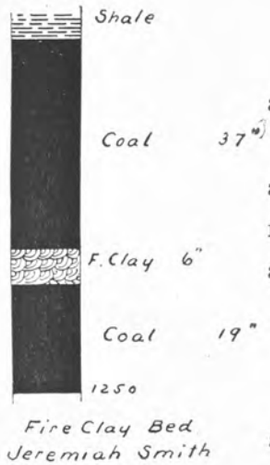


Figure 98 shows the lower one of the two beds noted on page 64, opened on Samuel Mullins' land at the head of Irishman, Right fork, the upper big bed being about 100 feet higher. The Mullins' opening presents a very handsome appearance in a well-opened entry into the Flag coal, but it is too high to afford much area in this vicinity.

The higher bed is of interest in this locality only because of its remarkable thickness, for it occurs only in small areas in the highest peaks.

Fig. 99

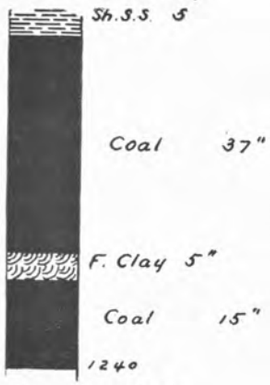


Little Branch.—On the right, ½ mile above Irishman creek.

A half mile up this branch, 40 feet above it and 195 feet (or less) above its mouth, the Fire-clay coal bed is opened as in figure 99, the parting a flint clay.

Smith Branch.—On the right, ⅝ mile above Irishman creek.

Fig. 100



Fire Clay Bed
Hillard Smith.

The section, figure 100, shows the same bed with like parting, in a rock-house, 1½ miles up the branch, 10 feet above it and 180 feet (or more) above its mouth. The elevations here and on Little branch indicate a slight reversal of dip, but it is more likely that they are incorrect, the latter probably being too high.

Breeding Creek.—On the right, 1¾ miles above Irishman creek. ("Little Carr" by early map of Kentucky Geological Survey.)

At the mouth of this creek a thick coal bed is said to have been penetrated in the stream, from which coal for local use was obtained. The bed rises with the stream, and a foot of the top of the coal shows above the water half mile up the creek. It is doubtless the Elkhorn bed, if the report is true, the interval from it to the Fire-Clay coal being about 200 feet. The bed should be found close above drainage for one or two miles or more up Breeding creek, and is not likely to exceed 3½ feet in thickness of coal, judging from openings farther up Carr.

Fig. 101

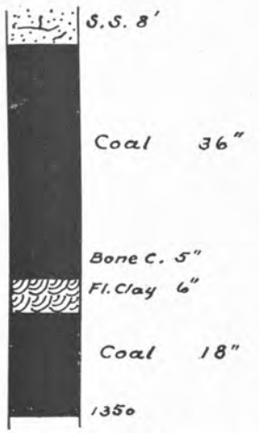
Fire Clay Bed
John Buck

Sugar Branch.—On the right, 1¾ miles up Breeding creek.

A quarter mile up this branch, at John Buck's, the Fire-clay coal, with bone coal and flint clay parting, is opened as in figure 101, at 230 feet above

Breeding. The coal below the parting was in water and not accurately measured.

Fig. 102

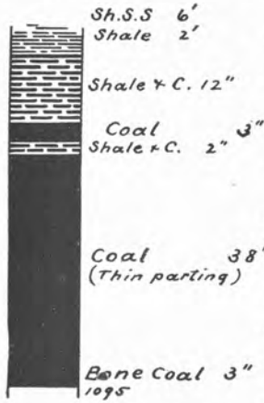


Fire Clay Bed
Noah Jent

Mallet Fork.—On the right two miles up Breeding.

A mile up this fork to Mare branch on the left, and ¼ mile up and to the left of the branch, Noah Jent has a 15-yard entry into the Fire-clay coal, which, at its mouth, has the section, figure 102. At the face the coal has diminished 10 in. and the parting 3 in., but this is probably due to a roll of little importance.

Fig. 103



Mouth of Little Carr
Elkhorn Coal

Little Carr.—On the right, 4½ miles above Irishman creek. ("Amburgy branch" by early map of Kentucky Geological Survey.)

The Elkhorn coal, which appears in the creek at the mouth of Breeding is about ten feet higher than the mouth of Little Carr, where it shows along the road up the main fork, and whence the section of figure 103 was obtained. My sample, taken from the 44 in. coal as exposed in the cliff, analyzed by Dr. A. M. Peter, yielded:

ELKHORN BED.	Laboratory No. 2756
Moisture	2.92
Volatile combustible matter	34.90
Fixed carbon	54.36
Ash (salmon)	7.82
	100.00
Sulphur	.65
Phosphorus	.009
Specific gravity	1.367
Coke	friable
B. T. U. per pound of coal	12,616
Total carbon	72.78

"Contains a good deal of dust and iron stain." Friable coke does not indicate a coking coal, but the appearance of the coal itself and its analysis are so favorable as to urge a more thorough test of its coking qualities.

An entry 200 yards up Little Carr, fallen in, shows the top coal no longer mixed with shale, 8 in. thick, then a parting of 17 in., with apparently solid coal below.

Fig. 104

Wolf-Pen Branch.—The measurements of figure 104, at John Amburgy's opening on this branch, were taken by Prof. Crandall. The bed is undoubtedly the Fire-clay coal or its rider, and its section is remarkably like the Grigsby openings of Lost creek, with shale between the cannel and common coal representing the fire-clay parting. Analyses by Dr. R. Peter of the two coals of this opening, sampled by Prof. Crandall, are given below:

FIRE-CLAY COAL	Chem. No. 2367 Bituminous	Report No. 2368 Cannel
Moisture	5.46	0.26
Volatile combustible matter	31.68	47.94
Fixed carbon	57.46	44.86
Ash	5.40	6.94
	100.00	100.00
Sulphur	.488	.751
Specific gravity	1.385	------
Coke	pulverulent	dense
Color of ash	light purplish	buff-gray

No. 2367. "A much weathered sample, in small lumps and powder. Soiled with clay."

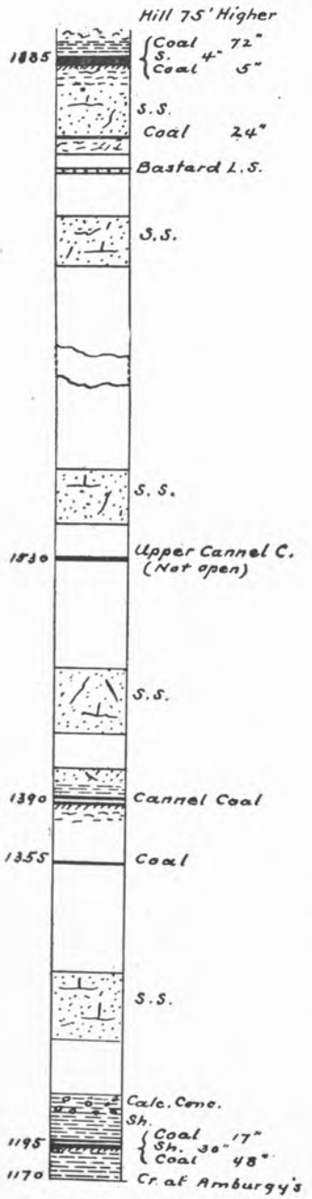
No. 2368. "A firm pure-looking cannel coal."

In a cliff and at water level, 1¼ miles up Little Carr, the Elkhorn bed appears again with this section:

Shaly sandstone	20 ft.
Coal	3 in.
Shale	14 in.
Coal	28 in.
Shale	1 in.
Bone coal	4 in.

The coal here is less than at the mouth or main head of Little Carr, (as shown below) but seems to be poorer yet, ⅛ mile up the right fork, where the parting has become six feet thick, the coal on it about 8 in. and under it but about 24 inches.

Fig. 105



Section on Amburgy Br.

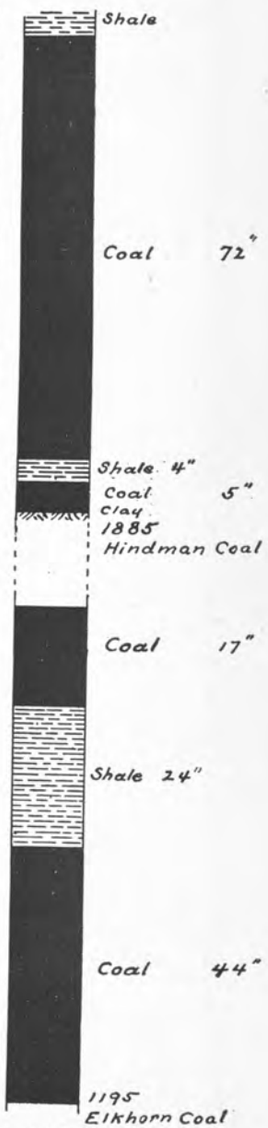
Amburgy Branch.—This branch is on the right of Little Carr near its head.

Prof. Crandall's section, figure 105, shows the Elkhorn coal 25 feet above Little Carr at Francis Amburgy's. The lower bed of figure 106 represents another opening there into the same coal, a very decided improvement on the bed as exhibited along the main road down the creek.

The next bed of the section, 160 feet higher, is probably the Whitesburg bed, not known to be workable on Carr fork.

The cannel coal 35 feet higher at elevation 1390 is then of the Fire-clay coal bed, 195 feet above the Elkhorn.

Fig. 106



F. Amburgy

The upper cannel coal shown seems likely to prove of the Haddix bed, though it may be one yet unknown. Its interval of 140 above the Fire-clay coal is small, and of 395 feet to the Hindman bed at the top of the section is large for the Haddix bed; but the long distance from any other point where the latter has been recognized is sufficient to account for the variation.

The interval between the Fire-clay and Hindman beds, 495 feet corresponds closely with that found on Troublesome, Right fork. The upper bed of figure 106 represents the opening into the Hindman bed here. Though having less coal here than on Troublesome, there is still enough to make it important, except for its slight area. Farther up Carr and the North fork the bed overreaches the hill-tops.

Betty Troublesome.—On the left, ½ mile above Little Carr: on one of the main roads between Hindman and Whitesburg.

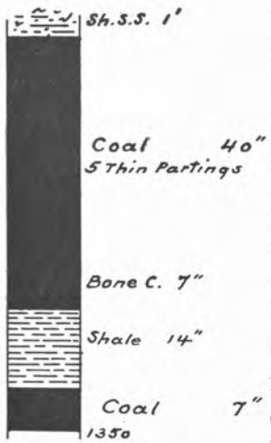
Two miles up this stream, 30 feet above it, and 190 feet above its mouth, the Fire-clay coal has been opened with the following section, below the limit of present workable coal, but of future value:

		Elevation
Sandstone	1 ft.	
Shale	2 ft.	
Bituminous shale	2 ft.	
Coal	27 in.	
Flint fire-clay	5 in.	
Coal	9 in.	1280

Brannon Creek.—On the left, four miles above Little Carr: on mail road between Hindman and Whitesburg.

The Elkhorn bed, (or one very near it) shows at the mouth of this creek, 20 feet above it, only 18 in. thick, with 20 feet of shale covering.

Fig. 107



A half mile up the stream and ¼ mile up a left branch Isom Sloane has started an entry, figure 107, into a coal rather unsatisfactory because of its number of partings and 7-in. bone coal. The partings, however, will probably diminish farther underground. The bed being 210 feet above the mouth of Brannon, it is probably the Fire-clay coal, but may be its rider, in which case a bed once opened 25 feet under it, said to be three feet thick, is the main bed. The presence of black slate on the dump of the lower bed is rather indicative of its being of the Whitesburg bed.

About 1½ miles above Brannon Creek, ½ mile above Pine Top P. O., what is probably the Elkhorn bed shows by the road, 50 feet above the creek, this section:

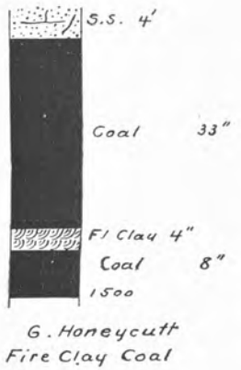
Sandstone	15 ft.
Coal	25 in.
Black slate	3 in.
Coal	2 in.

Though remaining above drainage some four miles farther up Carr fork, it does not appear that the bed has been opened in that distance.

Fig. 108

At Amazon P. O. three miles above Brannon creek, Alfred Amburgy has a ten yard entry, 270 feet above Carr fork, into the Fire-clay coal, figure 108, the brown flint-clay parting being unmistakable.

Fig. 109



Again at Grant Honeycutt's, 2½ miles farther up, (on the road to Rockhouse creek) 110 feet above the fork, here rising rapidly, the almost identical section of figure 109 was obtained; the flint clay being here black instead of brown.

A half mile or more above Honeycutt's some coal has been taken from the rider, at elevation 1560, apparently 40 feet above the Fire-clay coal. It is made conspicuous by a roof of black slate two feet thick, the coal itself, covered, being probably not more than that.

MACE'S CREEK.

Left Fork.—At William Singleton's, Viper P. O., a half mile from and 140 feet above the mouth of the creek, at elevation 1130, the Fire-clay coal has the following section:—

Sandstone	10 ft.
Coal	28 in.
Flint fire-clay	5 in.
Coal	8 in.
Black slate	3 in.
Bone coal	2 in.

Fig. 110

Fire Clay Coal
W. Campbell

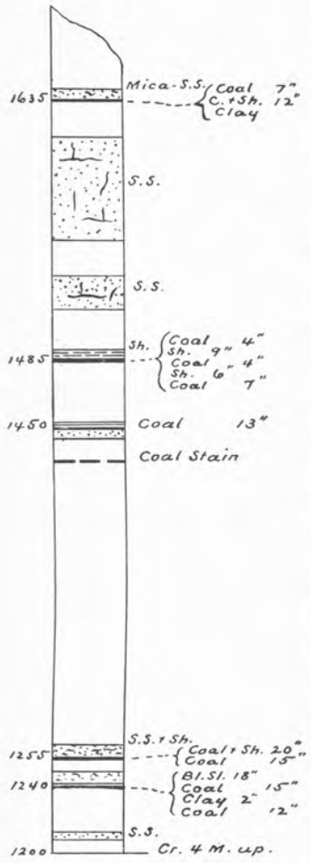
At Woolrey Campbell's, a mile from the river, the section of the same bed is as given in figure 110, but further development is needed before this can be considered as representing more than a very moderate area. A considerable part of the upper seam is splint coal, and the whole makes a very good appearance.

Fig. 111

John Babcock

Right Fork.—In the river hill, ¼ mile up the first right branch of this fork, on the John Babcock land, (now Burt & Brabb Lumber Co.) 570 feet above the river, and about 440 feet above the Fire-clay coal, a short entry gave the section of figure 111. Of the upper two feet of the bottom seam much is splint coal; the lower 14 in. was measured under water and may contain a small parting. The coal appears to be harder than that of the Hindman bed, and probably belongs to the Flag coal bed below it, to which its distance from the Fire-clay coal conforms. It is an unusually good exhibit for this bed, and there is enough covering over it to provide a good working area.

Fig. 112



Section at Wm. Farley's

The Fire-clay coal two miles up the Right fork (250 yards below John Pratt's), elevation 1100, has but 22 in. coal, divided one foot down by a 4 in. fire-clay parting. At two and one-half miles up, 30 feet above the creek, the bottom seam has doubled, to 20 in., and the roof here has some coal in it, possibly indicative of further increase.

But the prospect of increase to a workable thickness is much diminished four miles up, where, in the William Farley opening, the lowest coal of figure 112, the bed has but 28 in. of coal, if, as it appears, this is the same bed.

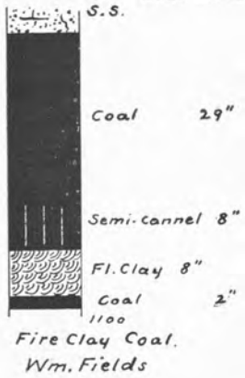
That other coals of this section do not give good thickness (although the Haddix and Hazard beds may be represented) is not enough reason for condemning the locality entirely. The constancy of the Hazard bed particularly leads to the hope that it, at least, had not been discovered when the section was taken, over 20 years ago, and though perhaps no later discovery has been made, there still remains opportunity for it. No definite knowledge of the succession of coal beds and their approximate value has heretofore been acquired.

BIG BRANCH.

William Field has made two openings into the Fire-clay coal, on the right, two miles up the branch, 100 feet above the mouth. Following is the section of the lower one.

Sandstone.
Coal ---------- 30 in.
Flint fire-clay ---------- 5 in.
Coal ---------- 6 in.

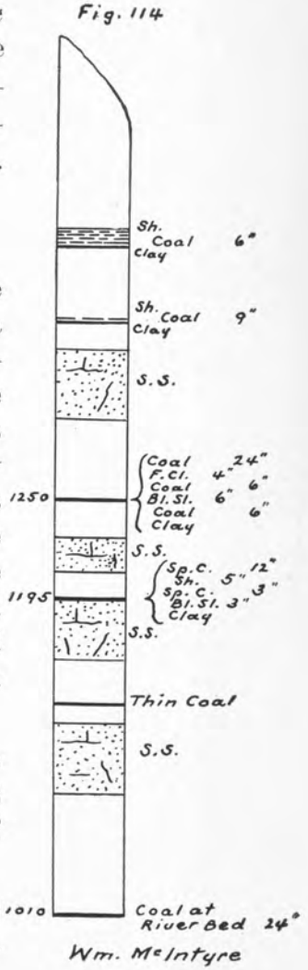
Fig. 113



The upper one in a ten yard entry, ten feet above the creek, has the section of figure 113.

On the left of the branch, behind the house a third opening shows the upper seam 34 in. thick.

Fig. 114



In the section, figure 114, taken one and one-half miles above Big branch, a rather rapid rise of strata is made evident, which brings what is probably the Elkhorn coal up to the river bed. Its thickness of 24 in. may be increased by a lower seam of coal under what was considered the floor of the bed, but the probability is rather against this. The distance of 240 feet to the Fire-clay bed is 30 to 50 feet more than is found towards the head of the river and on Carr fork.

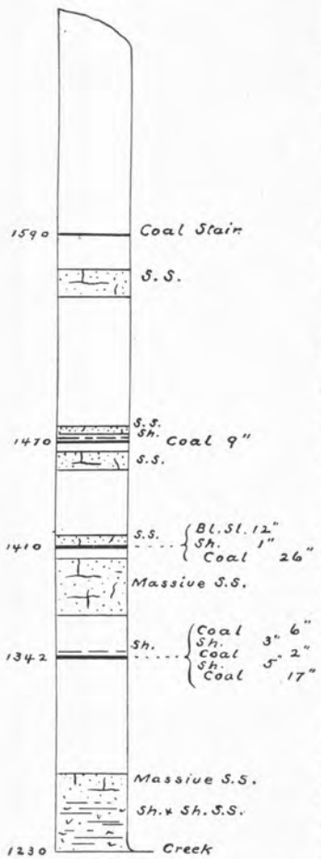
The Whitesburg coal, conspicuous at Hazard, here a good, but thin splint coal, has a black slate floor instead of roof as usual.

The Fire-clay coal, at elevation 1250 has here fallen below the limit of workable coals, and is not known to rise to it again elsewhere along the main stream above.

For higher coals it is necessary to go somewhat back of the low river hills here, in order to get much area.

LEATHERWOOD CREEK

Fig. 115



Little Leatherwood.—The section of figure 115, taken about four mies up Little Leatherwood in 1884, contains no workable coal, and it is hardly probable that any has been discovered there since then.

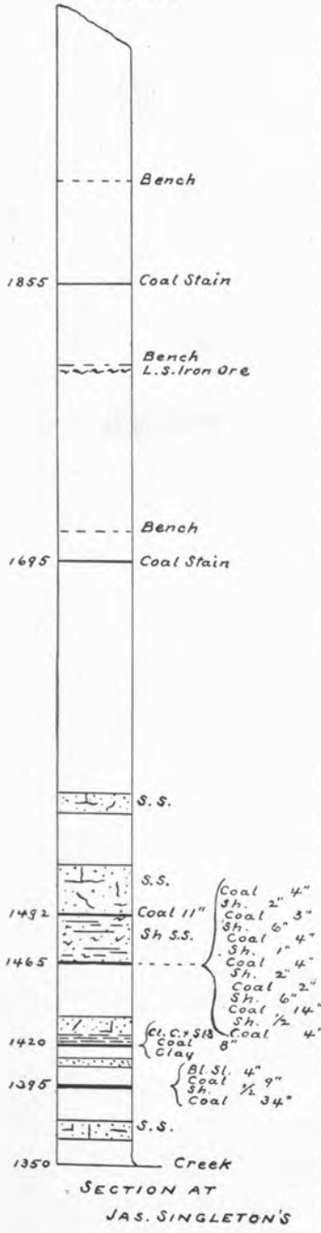
The Elkhorn bed, at or below drainage level begins to thicken to its large proportions only towards the head of the river above Whitesburg.

The Fire-clay coal is, presumably, the 26 in. coal at elevation 1410. The surrounding openings of this bed, though they are distant, are against any favorable anticipation of this vicinity.

The stain of the Haddix bed might give a satisfactory result if opened, but the bed appears to have nearly run out before reaching as far south as Hazard, and does not seem to recover working thickness except at far distant points.

The only favorable prospect is in the Hazard bed, which is in good condition on main Leatherwood and on Line Fork. The hill with the section taken is not high enough for a mining area of this coal, but others in the vicinity are.

Fig. 117



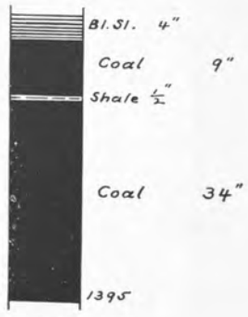
At Henry Singleton's, 4 miles up main Leatherwood, ¼ mile up a right branch and 240 feet above the creek, the Fire-clay coal has been entered some 80 yards. The bottom seam of coal is here absent, the dark, flint fire-clay floor being the usual parting. The remainder of the bed, showing as in figure 116, is not seriously injured by its parting, which, being a soft bituminous shale, can be made available as a mining seam.

Fig. 116

Singleton
Fire Clay Coal

Beech Fork.—Figure 117 represents a section taken two and one-half miles up Beech fork. Without additional information the identity of the coal beds cannot be decisively stated, but it is probable that the Fre-clay coal is the lowest of the section, (shown enlarged in figure 118) its rider being 20 feet above it.

Fig. 118



J. Singleton

A new bed, or one not elsewhere on the North fork worthy of note, appears then 70 feet above the Fire-clay coal, become conspicuous because of its many partings. What is perhaps the same bed is found at rare intervals on Middle fork waters, sometimes so close to the lower bed as to have become a rider to it, and to have absorbed the more usual rider.

The coal stain 230 feet higher in the section is probably of the Hazard bed, and should develop into good thickness with a large area in the high hill where it was found.

The higher coal stain, reported carrying cannel coal, should be of the same bed as the Babcock coal (57 in. thick) on Mace's creek near its mouth. While the bed is rather variable the prospect is fair of finding it workable here.

The upper bench may mark the level of the Hindman bed, and its 100 feet of covering gives promise of a restricted workable area, obtainable at such height only by a thick and valuable coal, such as that bed is found to be at other points.

Fig. 119

John Couch

Grave Branch.—On the left, one and one-half miles above Beech fork.

Beside this branch 90 feet above its mouth, an opening has been made into what is called the four foot bed, (the Fire-clay coal of Oldhouse branch farther up Leatherwood), but it is now closed so that nothing can be seen of the coal. It is believed that the Fire-clay coal is about 80 feet higher, at elevation 1390, corresponding more nearly with the Henry Singleton (p. 116) and J. B. C. Cornett opening (p. 119).

The opening shown in figure 119, on the right of Grave branch ¼ mile up it, is then in position for the Hazard coal, but the correlation of this, as of other high coals toward the head of the main creek, requires more data for certainty.

On the main creek, at its level, two miles above Beech fork, openings have been made into a 3 foot bed of clean coal, elevation 1225, which, though apparently too high for it, may be the Elkhorn coal. It does not appear that the bed maintains its thickness farther down the creek, and farther up it is below water level.

Clover Fork.—Coal, said to be two and one-half feet thick, has been dug from a bed in the right fork of this creek, two miles from its mouth, at elevation 1400. This appears to be the level of the Fire-clay coal.

Fig. 120

At the extreme head of the fork, about three miles up, to the right of the path to Laurel fork of Cutshin creek, 340 feet above the lower coal, the coal of figure 120 is opened. This, as on Grave branch, appears to be of the Hazard bed. It is opened again on Laurel fork of Cutshin, having cannel coal there.

An interesting occurrence of conglomerate pebbles in quantity was noted, in the stream below this opening. In tracing to their source they seem to come from a soft sandstone, two feet thick, outcropping in the bed of the stream 90 feet below the coal; but none of them were found in the sandstone itself. They probably come from the upper Conglomerate sandstone especially conspicuous in the Black Mountains of Harlan county.

Oldhouse Branch.—On the right, one and one-fourth miles above Clover fork.

On J. B. C. Cornett's land at the road forks, ¼ mile up this branch the top of an old opening on the right showed:—

Shale and clay	10 ft.
Coal	14 in.
Shale	10 in.
Coal	5 in.
Shale	2 ft.

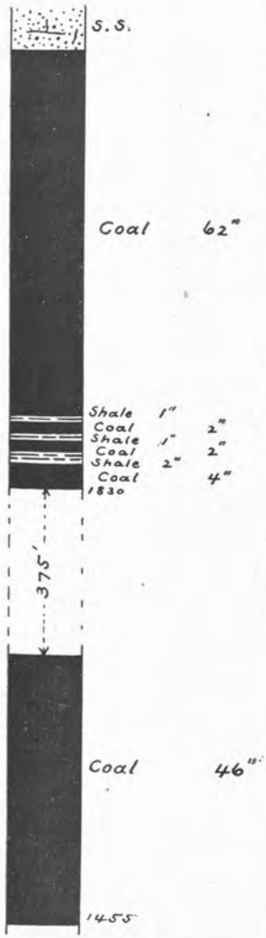
Some four to six feet of the opening below was covered, but in a private report to the Tennis Coal Co., there is stated to be in the entry driven there 46 in. fine bright coal, (more or less of it soft and coking coal). The measurement is without doubt accurate and is shown in the lower bed of figure 121.

The elevation of the bed, 1455, makes it probably the Fire-clay coal, with its rider still visible above it. It is 125 feet above the mouth of the branch.

On the left road fork, one and one-half miles from the main creek, William Shepard has a small entry 375 feet higher than that just described, with coal as represented in the upper bed of figure 121. This is probably of the Hazard bed, the apparent increased interval from the Fire-clay coal being due to a rise of strata between the openings.

In my sample of this coal the upper 17 in. was not included, and it is stated, in the report before referred to, that at no time in mining was more than 46 inches of coal used,

Fig. 121



Oldhouse Br.

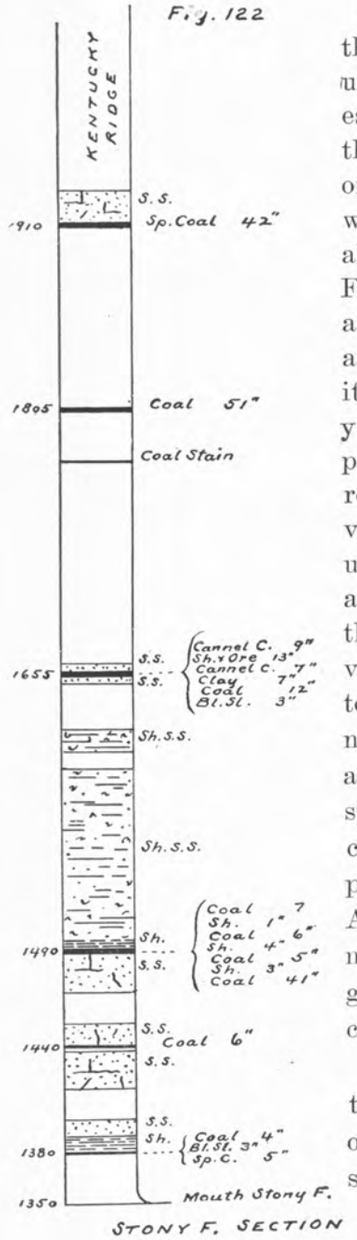
the mixed coal and shale at the bottom providing a mining seam. The 46 in. solid coal underground, which may be considered the true thickness, is a fine, bright coal, partly splint. My sample, taken on the discovery of the coal by the Survey, was from the outcrop, and is evidently too high in ash. Dr. R. Peter gives its analysis as follows:

Chem. Report No.	2545
Moisture	1.40
Volatile combustible matter	28.60
Fixed carbon	58.00
Ash (very light gray)	12.00
	100.00
Sulphur	0.958
Specific gravity	1.362
Coke	dense

"A weathered sample of what appear to be bituminous and splint coals, which seem to be pretty pure."

On the right fork, one mile from the main creek, at elevation 1800, an old entry with the bottom coal covered still has visible three to three and one-half feet of coal, with shaly sandstone roof. This coal is evidently of the same bed as the preceding; both are 20 to 30 feet below a very conspicuous bench.

Fig. 122

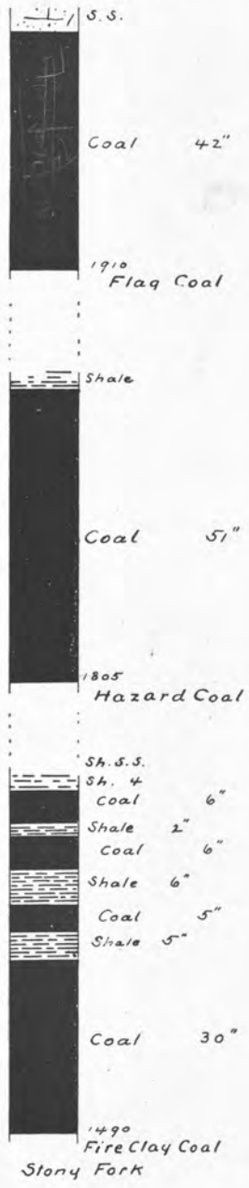


STONY F. SECTION

Stony Fork—In the section, figure 122, the lowest bed of note is the Fire-clay coal of elevation 1490, which is exposed along a cliff at Friley Browning's, a mile up the fork and 25 feet above it. In the 20 to 30 yards exposure, partly mined under roof, there is little variation in the upper coal seams and partings, but the bottom seam varies from 30 in. to 41 in. in thickness, and in character from a mixed splint and block coal, to the same partly slickenseit. A second measurement of the bed is given in the lowest coal of figure 123.

My sample of the bottom bench of this coal and specimen of this

Fig. 123



Stony Fork

slickenseit were analyzed by Dr. R. Peter with the following results:

Chem. Report No.	2539	2547
FIRE-CLAY COAL	Lower Bench	Slickenseit
Moisture	1.40	1.44
Volatile combustile matter	28.20	38.06
Fixed carbon	53.90	54.90
Ash	16.50	5.60
	100.00	100.00
Sulphur	0.978	0.972
Specific gravity	1.799	1.276
Coke	dense	dense
Ash	very light gray	nearly white

No. 2539. Though taken from a muddy outcrop Dr. Peter reports: "A pretty pure-looking sample. Breaking into thin, irregular laminae, with some fibrous coal apparent, but no pyrites visible." The excessive ash cannot all be attributed to adhering mud, nor does a late view of the well-opened bed indicate a poor coal.

No. 2547. "Pitch-black pure-looking coal. Fracture irregular. No fibrous coal or pyrite apparent."

The coal at elevation 1805 of the section, shown enlarged in figure 123, is taken from a report to the Tennis Coal Co., as found on land of J. B. C. Cornett. The bottom is said to be hard block coal, and the 27 in. next above a bright block. It is doubtless the same coal as that described farther down Leatherwood as presumably of the Hazard bed.

Smith Branch.—The Flag coal, the upper coal of figure 123, found on this branch of Stony fork, but not identified elsewhere in a long distance, gives incentive for a special search for it in this region. The three beds together make a rich field, especially as even the higher ones have a large area in the extension of Kentucky ridge between the heads of Leatherwood and Line fork.

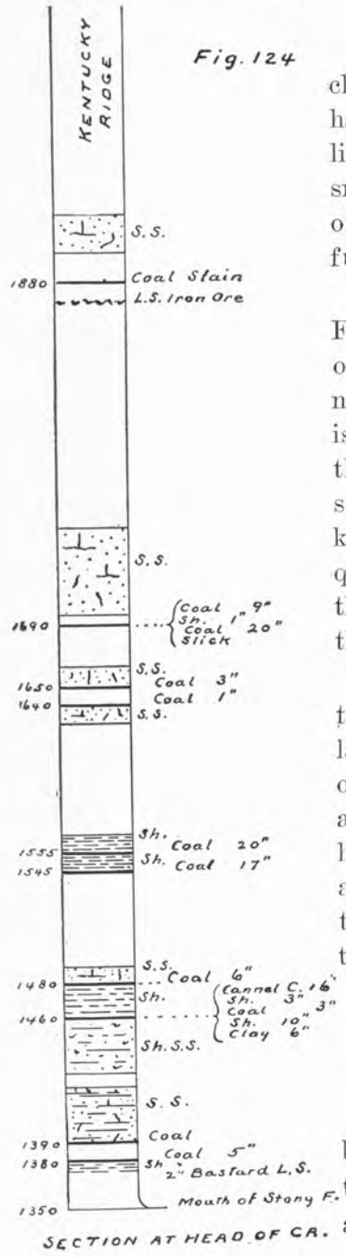


Fig. 124

In the section, figure 124, the Fire-clay coal, at elevation 1460, appears to have diminished to 19 in., but this seems likely to be due to a local disturbance of small area. The cannel coal at the top of the bed gives added inducement to further investigation.

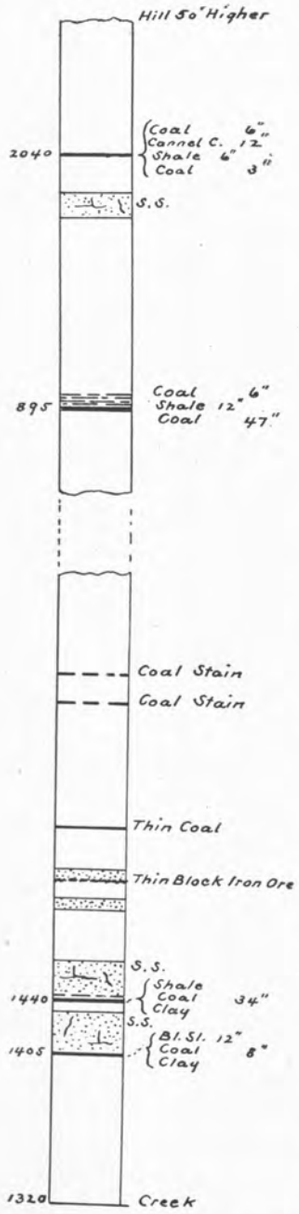
What variation of interval from the Fire-clay coal to the Haddix may have occurred in the many miles from the nearest recognized opening of the latter is not known, but is probably slight, and the 29 in. coal, of which most is slickenseit, may answer for the latter bed. The known irregularities in thickness and quality of this bed should lead to, rather than discourage further investigation in this region (as well as elsewhere.)

The Haddix and Flag beds, the latter the top coal of the section, both have large areas in the main ridge at the head of the creek, and the Hindman bed is also worth looking after. The ridge is high enough to give them workable areas, and there is almost a certainty that the Hindman bed will disclose a thick coking coal.

LINE FORK.

At the mouth of Line fork the strata have so far emerged above the river that the Elkhorn bed should be above drainage, as well as other coals below it, but

Fig. 125



Section at Ira Stampers

low deserves notice none of any value have been found near their level and it seems that nothing has been done toward their identification. Some coal was mined from a bed reported four feet thick, with shale parting and black slate roof, some 300 feet above the creek, which may be of the Whitesburg or Fire-clay coal; but the opening having been abandoned was not visited.

In going up Line fork there is an additional emergence, but still the lower beds, so far as yet discovered, remain thin.

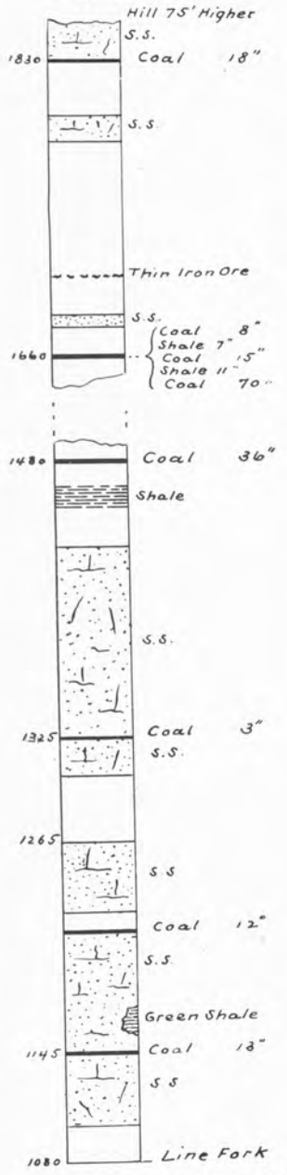
Turkey Creek.—The section, figure 125, taken near the head of Turkey creek, should show, if complete, the Elkhorn bed near its base, the Fire-clay bed and its rider being probably represented in the coal stains at elevation 1605-1620.

The Hazard bed is then, and with little reason to doubt, the thick coal at elevation 1895, shown enlarged in figure 126. The prevalence of thick coal in this bed, and the uniformity of its distance (about 300 feet) from the Fire-clay coal behere.

Fig. 126

Ira Stamper

Fig. 127



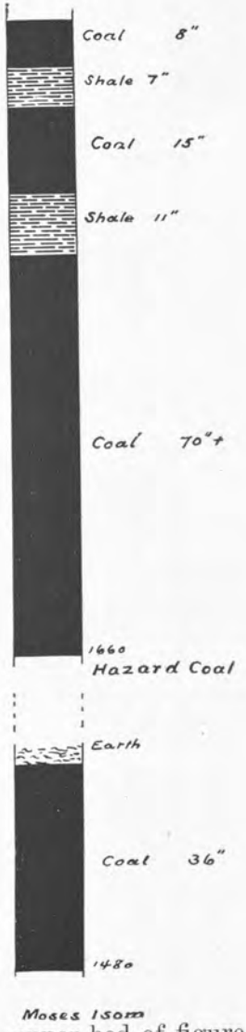
Section at Moses Isoms

The Flag coal, if such it is, (mostly cannel) near the top of the section, is higher than usual above the Hazard, but if there is no actual thickening this may be accounted for by the pitch of strata between the two openings, or by barometric inaccuracy.

The section of figure 127, near the mouth of Defeated creek, gives perhaps the lowest strata exposed on Line fork, about 600 feet below the Hazard coal, and probably within 100 feet of the conglomerate measures.

The Fire-clay coal appears to be cut out by sandstone here, and the 36 in. coal, at elevation 1480, to be too high for its rider, yet a bed of the same thickness appearing lower on Defeated creek, tends to such correlation. There can be little question of the identity of the thicker coal at elevation 1660, shown in enlarged scale, the upper bed of figure 128. It is of the Hazard bed.

Fig. 128



Moses Isom

Fig. 129

Defeated Creek.—At Ira Hall's, some two miles up this creek and 60 feet above it, the Fire-clay coal, at elevation 1400, has been stripped with the following section:

Massive sandstone.	
Shale with coal	3 ft.
Cannel coal	15 in.
Cannel slate	3 in.
Cannel coal	7 in.
Cannel slate	

The slate is apparently the bottom of the bed, and below this is a thick shale mixed with black slate and sandstone, instead of the cliff-making sandstone found down the river. Where this coal goes under the branch on the left of the creek it measures 36 in. solid cannel, as in figure 129, and lies directly under the massive sandstone.

A mile farther up Defeated creek, behind Jack Frasier's house, the rider is opened 70 feet by barometer above the cannel openings, but, allowing for rise of strata, probably about half that distance above the Fire-clay coal. Under sandstone, it has 35 in. bituminous coal separated by one in. to two in. bone coal, and eight feet below this is another seam of coal six in. to eight in. thick.

Fig. 130

By the road, 40 feet above Line fork at Joseph Cornett's, two miles above Defeated creek, an entry is driven into the coal and slate represented in figure 130. None of the coal looks very good, and there is no clear line of demarkation between the coal and slate, the two coming out easily in one block. More coal is said to lie below, but it is probably nothing more than black slate and it is not mined. Analysis by Dr. A. M. Peter, of my sample of the 43 in. cannel from the mouth of the entry as given below, shows the coal to be worthless, but it is evidently of the same bed as the excellent King's creek coal, four miles east of it. It lies close to the horizon of the Elkhorn bed.

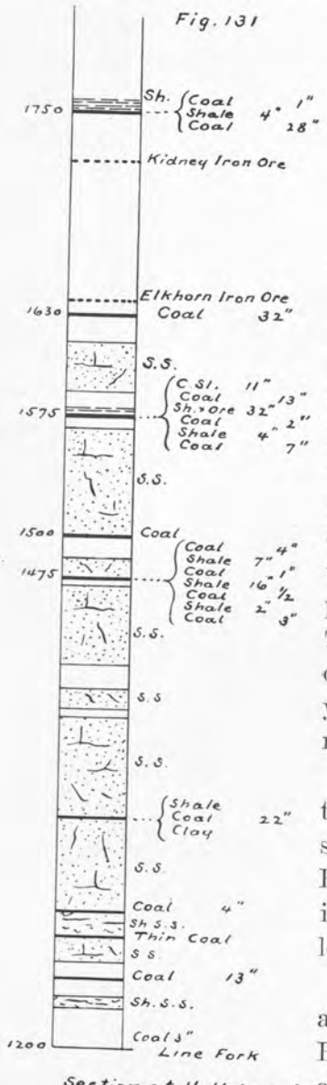
Laboratory No.	2736
Moisture	1.01
Volatile combustible matter	34.04
Fixed carbon	39.10
Ash (reddish brown)	25.85
	100.00
Sulphur	0.54
Specific gravity	1.493
Coke	friable.
Total carbon	58.63
B. T. U. per pound of coal	11,307

"Average sample of bright rather pure-looking cannel coal, somewhat weathered as if from near the outcrop." The ash was not materially increased by inclusion of foreign matter in the sample.

Dry Fork.—On the left, two and one-half miles above Defeated creek.

The same bed shows in outcrop by the road but little over one foot of cannel coal.

At the mill a mile above Dry fork the coal and slate of the same bed have been taken from the creek, with thickness not ascertained. The best of this coal does not present an attractive appearance.



The section, figure 131, taken about two miles above Dry fork, though showing no coal beds in characteristic form, can be used to approximate the position of some of them.

The 22 in. coal at elevation 1330 appears to be of the Fire-clay bed, recognized a mile farther up the creek. The Haddix coal is then one, or both, of the coals at elevations 1475 and 1500, and the Hazard and Flag coals are represented by the beds at elevation 1575 and 1630. The exhibit is not promising for the region, but it is quite possible that the main coal beds may be in the spaces covered with earth, left blank in the section, or that an unfortunate selection of place was made for taking the section. The fact that nothing better has been discovered in the vicinity in the last 22 years, since the section was taken, is not encouraging.

In this end of the extension of Kentucky ridge there is area enough and should be good thickness of coal in the Hindman bed. Its height has rendered its discovery less likely than that of lower beds.

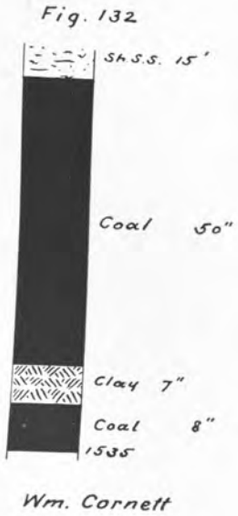
At Jesse Holcomb's, three miles above Dry fork, (one mile below the Hurricane Gap road) at elevation 1400 and 140 feet above the creek, ¼ mile up

the branch, the Fire-clay coal, is opened 30 in. to 32 in. thick in an eight yard entry. It is a hard, compact, brecciated coal, partly slickenseit and with some splint. Only the upper seam of the bed is present, brown flint fire-clay, the usual parting, making the floor of the bed. The strong sandstone roof has permitted making the entry broader than it is long, almost without props.

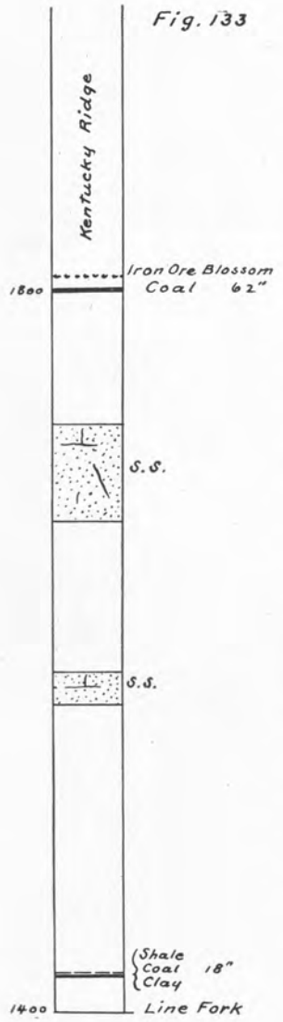
Higher coals have not been opened here, but 220 feet above the entry is what is called the main bench of the mountain, the floor, probably, of the Haddix coal.

An impure black and gray limestone a foot or more thick containing small fragments of shells in no great abundance lies 270 feet above the Fire-clay coal. (See also figure 173, elevation 1945.)

At William Cornett's, two miles above the Hurricane Gap road, 50 feet above the creek, at elevation 1390 as obtained, but probably higher, the Fire-clay coal bed has 34 in. clean coal under sandstone. The brown, flint fire-clay parting forms the floor, and contains here abundant plant remains and some lime.

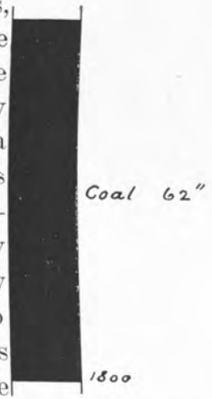


A mile farther up, on William Cornett's land, elevation 1535, (145 feet above his Fire-clay coal) is the coal of figure 132. The bed is probably the Haddix with the 200 feet interval to the Fire-clay bed farther down the North fork diminished, as openings on lower Line fork indicate. The latter bed must be near the creek level. The apparent dip of strata from Jesse Holcomb's, below Dry fork is probably due to errors in ascertaining heights, for the strata as exposed evidently lie nearly level along the creek.



Coils Branch.—On the Hardin Sparkman tract, now Burt and Brabb Lumber Co., four miles up from Hurricane Gap road, the section of figure 133 was taken.

According to the elevations of the last two preceding openings the Haddix and Hazard beds should be somewhat under the two sandstones of the section, and the upper coal then corresponds in distance above the Hazard to the Flag coal on Turkey creek, figure 125. It is rather difficult to believe, however, that this is not the same bed as the Hazard of Turkey creek, and until further investigation is made the correlation must remain in doubt. Whatever bed it is, there is a large area of it in the high Kentucky ridge, and it is a very pure coal as shown by the following analysis by Dr. R. Peter of my muddy outcrop sample. It is shown on large scale in figure 134.



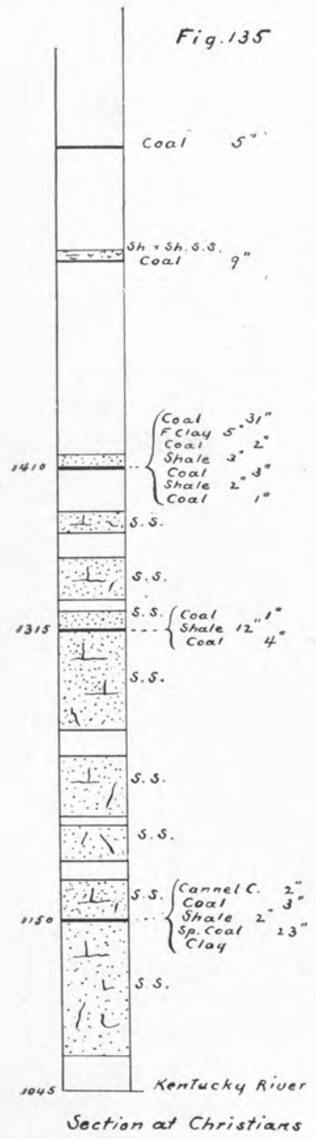
Chem. Report No.	2537
Moisture	3.06
Volatile combustible matter	33.54
Fixed carbon	59.20
Ash (salmon colored)	4.20
	100.00
Sulphur	0.547
Specific gravity	1.321
Coke	dense.

"A pure-looking, pitch-black coal. Fracture generally irregular; some portions in irregular laminae. No appearance of pyrites and very little of fibrous coal." "This appears to be remarkably pure and good coal. It is probable that beyond the weathered outcrop the proportion of its ash may be somewhat smaller, while its sulphur percentage may be slightly larger."

At the forks of the creek, a mile farther up, W. R. Lewis has opened two coals as given below.

		Elevation
Shale	8 ft.	
Slickenseit coal	31 in.	1580
Sandstone	3 ft.	
Shale	5 ft.	
Coal	3 in.	
Shale	4 in.	
Coal	12 in.	
Clay	12 in.	
Coal	11 in.	1520
Creek at forks		1480

One or other of these appears to be of the Haddix bed, possibly both are, for a separation of the bed into two parts seems to have begun farther down the creek (See figure 131, elevation 1475 and 1500) and coals on streams farther west indicate it.



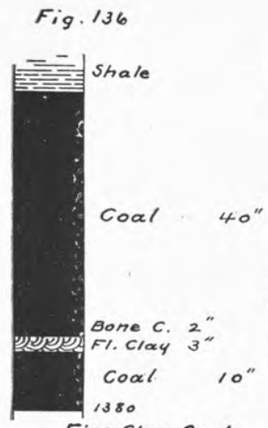
Four miles up the river from Line fork was taken the section given in figure 135. The coal at elevation 1150 is, with little doubt, the Elkhorn bed. The tendency of the bed toward cannel, shown in the two inch cannel at the top of the bed here, being duplicated in the bottom of the bed at the mouth of Potter's fork and elsewhere near the head of the river.

The Fire-clay coal, 260 feet higher is determined here without question by its distinguishing parting. The lower partings contain siderite in the shale, as do those of two higher beds on Line fork. (Figure 131, elevations 1475 and 1575)

The Hazard being the next bed above the Fire-clay coal at all likely to be thick, and some 600 feet above the river, with small area in the river hills, the coal of this vicinity can be of but little value.

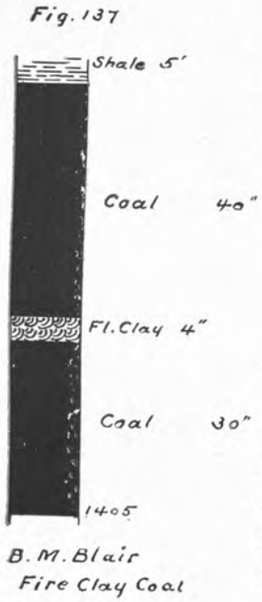
ROCKHOUSE CREEK.

At the mouth of Doty branch, on the left, five miles up Rockhouse, Grant Isom opened what is probably the Elkhorn bed, 80 feet above the creek, under sandstone. He reported it a very hard coal 32 in. thick.



Above it, 185 feet, the following bed section was found, probably of the Whitesburg bed:

		Elevation
Shale	4 ft.	----
Coal	6 in.	----
Shale	2 in.	----
Coal	4 in.	1335
Bituminous sandstone	1 in.	----
Coal	12 in.	----



Doty Branch.—At 45 feet above the preceding coal, or 230 feet above the probable Elkhorn bed, Isom's 30-yard entry into the Fire-clay coal gives the section of figure 136.

Blair Branch.—On the right, six miles up Rockhouse.

B. M. Blair's 17-yard entry into the Fire-clay coal, 330 feet above the creek, a half mile up the branch, having water in it, was measured at its mouth with the result given in figure 137.

Fig 138

Head of Little Colly
Whitesburg Coal

Little Colly.—No information was obtained of the coals on this stream, excepting opposite the extreme head of Camp branch. Some 15 feet above the road there an entry has been made into the Whitesburg bed, showing 41 in., as in figure 138, of hard bright coal without face or butt cleavage. It is the first known opening of workable thickness into this bed above Hazard, and, when taken in connection with those on Smoot and Dry creek, it proves a good area of rather high but workable coal.

The Fire-clay coal was once opened about 30 feet higher in the same cove.

Millstone Branch.—On the left, three miles above Little Colly creek.

Ten feet above the mouth of this branch, at elevation 1115, is a coal with parting about two feet thick to which Prof. A. R. Crandall of the Survey gave the name of Sand-Lick. Being most conspicuous, more regular and typical on Rockhouse creek, the name of that creek is now adopted for the bed. On its covering of 30 feet shaly sandstone and shale is one foot more of coal very persistent for some miles up the creek, the two seams showing frequently in close proximity.

Another thin seam, less conspicuous, lies about the same distance below the Rockhouse bed.

John Sexton has a 10-yard entry into the Fire-clay coal, a half mile up the branch and 350 feet above its mouth. Its

section as taken at the mouth of the entry, is shown in figure 139, the bottom 8 in. having been measured in mud and water.

Fig. 139

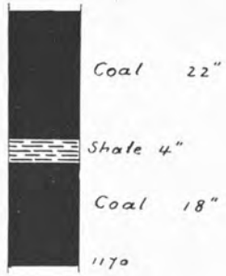
John Sexton
Fire Clay Coal

Surrounding, though distant, openings indicate that the upper partings will not remain constant, and the middle parting of bituminous shale is particularly likely to disappear. The cannel coal, apparently in one block, presents an especially handsome appearance, and a specimen of it was taken for analysis, from which Dr. Alfred M. Peter obtained the following results:

FIRE-CLAY CANNEL. Laboratory No. 2754

Moisture	.39
Volatile combustible matter	46.11
Fixed carbon	40.50
Ash (grayish brown)	13.00
	100.00
Sulphur	2.00
Specific gravity	1.309
Coke	dense.
B. T. U. per pound of coal	13,893
Total carbon	74.3

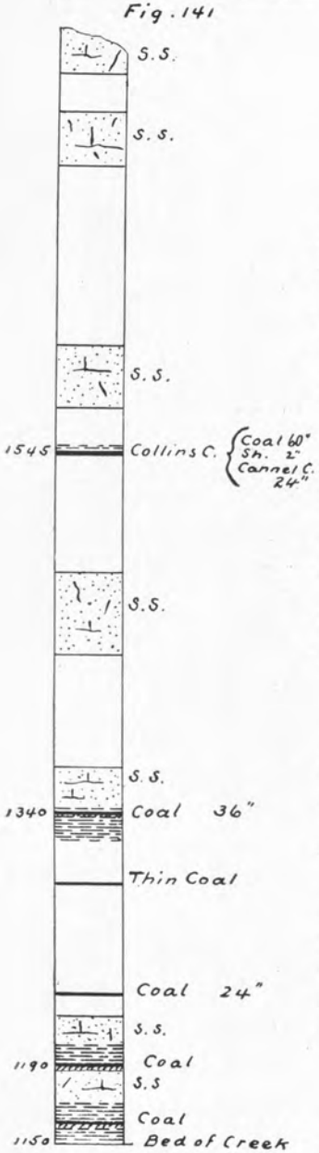
Fig. 140



Mouth of Camp Br.
Rockhouse Coal

By the road just below the mouth of Camp branch is an entry into the Rockhouse (or Sand-Lick) bed, which has at its mouth the section shown in figure 140.

Fig. 141



Section at mouth of Camp Br.

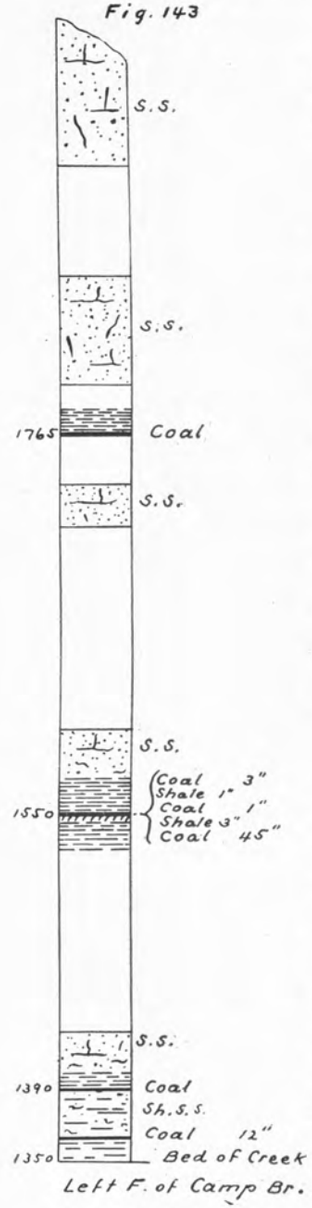
Camp Branch.—The section of figure 141, taken on Camp branch near its mouth, is, like all other figures of sections on North fork waters following in this report, reproduced from an early report of Prof. Crandall for the Survey.

The Rockhouse coal, at elevation 1190, rising slightly faster than the stream bed, is somewhat thicker here than below Camp branch, and probably continues so with some exceptions nearly to the head of Rockhouse.

Prof. Crandall's sample of this coal from the J. M. Collins' opening, where it is 44 in. thick, analyzed by Dr. R. Peter gave:

ROCK HOUSE BED.	Chem. Report No. 2357
Moisture	1.46
Volatile combustible matter	35.84
Fixed carbon	58.60
Ash (brownish gray)	4.10
	100.00
Sulphur	1.968
Specific gravity	1.242
Coke (light spongy)	62.70

Fig. 143

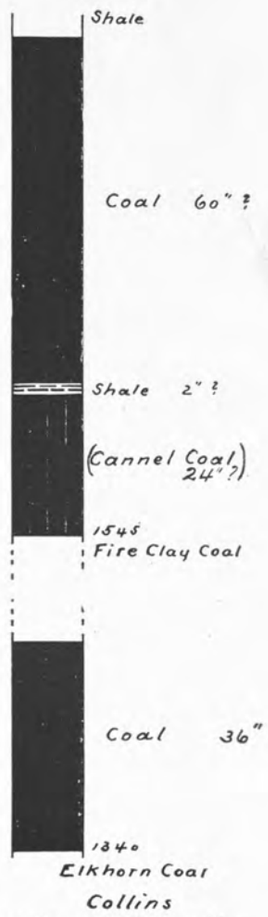


Left F. of Camp Br.

The Elkhorn bed is shown in the section 150 feet higher, and again in the bottom coal of figure 142.

The Fire-clay coal, 205 feet higher, is shown next in both figures, with the cannel at the bottom increased to 24 in., but the measurements of the whole bed are given with some question, doubtless due to imperfect opening.

Fig. 142



The section, figure 143, taken near the head of Camp branch, shows the three principal beds of lower Camp branch at about the same respective heights from the creek and intervals apart as at the mouth of the creek. The

Fig. 144

Dr Breeding
Elkhorn Coal

middle, Elkhorn, bed is given on enlarged scale in figure 144.

Farther up the stream, toward Thornton creek, the thin coal 30 feet above the Rockhouse bed is conspicuous for some distance just before it goes under drainage.

There is little reason to expect a workable quantity of coal here higher on the hill than the upper one of these beds, but they all three are probably workable throughout the length of the creek; the highest being but little more than 400 feet above drainage, and they all appear to be of excellent quality, one of them probably a good coking coal and another in part cannel of good quality, as judged by its condition on Millstone branch. (See page 135).

Besides these three, under the Fire-clay coal, is the Whitesburg bed with 41 in. clean coal just across the divide, on the head of Little Colly, likely to give workable coal on Camp branch. Altogether it is one of the most promising localities of the Kentucky river basin.

Fig. 145

Right Fork
Rockhouse Coal

Right Fork.—Two miles up Camp branch.

The Rockhouse coal shown in figure 145 contains four knife-edge partings not likely to be continuous underground. The opening is at stream level a quarter mile up the fork and 2¼ miles from the main creek.

About 30 feet higher is 8 in. coal under sandstone.

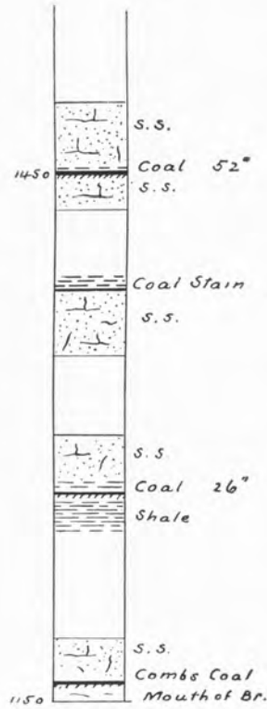
The Fire-clay coal is well opened in a 10-yard level entry 100 yards to the left of the road in the Sand-Lick gap, its parting of flint clay having increased somewhat, and its coal much less. Its bed section is shown in figure 146.

Fig. 146

Sand Lick Gap
Fire Clay Coal

Trace Branch.—On the left, one mile above Camp branch; Hindman-Whitesburg road.

Fig. 147

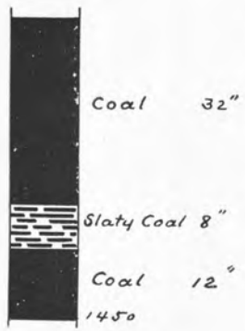


Section on Trace Br.

The thin coal formerly mined by Mr. Combs, at the mouth of this branch, shown in the bottom coal of the Trace branch section, figure 147, was identified by Prof. Crandall as the bed 30 feet below the Rockhouse bed. The latter bed appears not yet to have been opened about here.

The 26 in. coal, 110 feet higher on the section, is probably the Elkhorn coal (needing further examination to prove its reduction from usually constant thickness). The opening was probably made some distance up the branch, and as the strata dip in that direction the actual interval between this bed and those below is greater than is shown and doubtless is nearly in accord with those obtained on Camp branch.

Fig. 148



The Fire-clay coal shown enlarged in figure 148, called a splint coal, has a parting of slaty splint coal in place of the usual fire-clay. The analysis by Dr. R. Peter of the 32 in. upper seam shows it a remarkably pure coal.

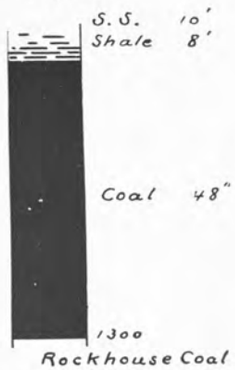
FIRE-CLAY COAL.	Chem. Report No. 2369
Moisture	1.30
Volatile combustible matter	38.10
Fixed carbon	58.40
Ash (purplish-gray)	2.20
	100.00
Sulphur	.71
Coke (light spongy)	60.60

"A very pure-looking, pitch-black coal. Fracture generally irregular, with brilliant surfaces. Small bird's-eye structure in parts. No fibrous coal apparent, and very little of bright pyrites." It seems to resemble cannel in appearance, but not in composition.

Fig. 149

Two miles above Camp branch, 20 feet above the creek, is the coal shown in figure 149, which, from its position and thickness, is judged to be of the Rockhouse bed. Those beds immediately above and below it are not known to attain a workable thickness anywhere on the creek.

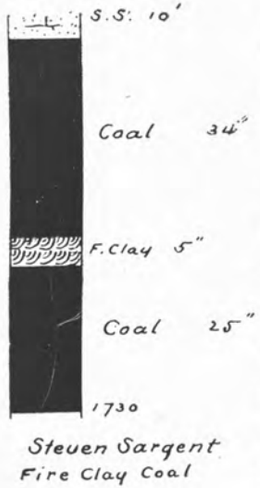
Fig. 150



Indian Creek.—On the right, three and three quarter miles above Camp branch.

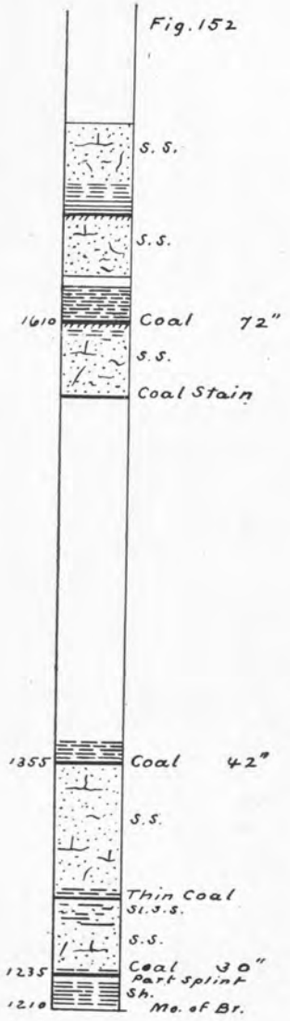
At Allen Martin's, two miles up the creek, the Rockhouse bed, at creek level, has four feet of clean, good coal, as in figure 150. For half a mile or more the bed is in view in long exposures with almost unvarying thickness, rising with the stream and nowhere more than five feet above it. At the forks, three miles up, the bed is no longer visible, but is still close to stream level.

Fig. 151



A half mile up the point between the forks is the Sargent, Fire-clay coal of figure 151. The lower six in. of this coal, in water when visited, was said to be cannel. The parting is without the usual flinty character of the Fire-clay coal, but the bed could hardly be mistaken. The sandstone roof shows a tendency toward shale. Though the bed is about level with the road gap to Millstone, there is a large area of it available in this region.

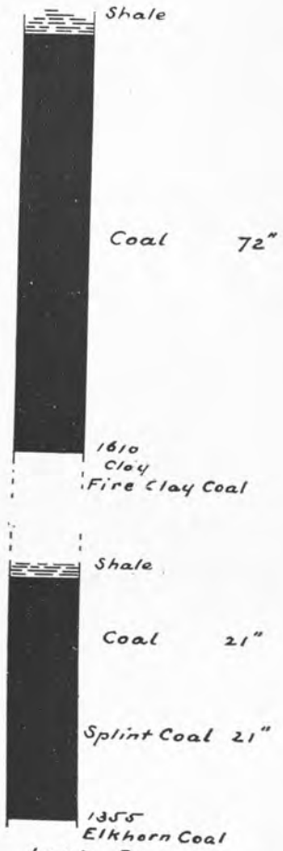
Fig. 152



Love Branch.—On the left, four and one half miles above Camp branch.

In the section, figure 152, the lowest coal is evidently of the Rockhouse bed, and the 42 in. coal, of which the lower half is splint, doubtless represents the Elkhorn bed, although the interval shown is smaller than is usual. This is to be accounted for, as on Trace branch, page 139) by the supposition that the higher bed was found farther up the branch and down the dip than was the lower. The lower coal of figure 153 represents this Elkhorn opening.

Fig. 153



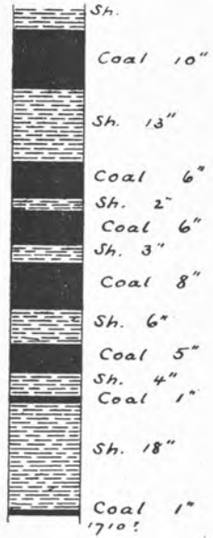
The Fire-clay coal of elevation 1610 is shown on enlarged scale, the solid, Kizer, 72 in. coal of figure 153. The measurement of this bed having been taken where it had broken off and slipped from the rest of the bed, it is quite possible that its fire-clay (and perhaps other) parting had slipped out altogether. The following analyses of the coal, by Dr. R. Peter, were made from samples collected for the Survey by J. A. Shackelford; No. 2365 from the bed in place, showing a very superior coal; No. 2366 showing the effect of a large infusion of mud into the bed, increasing the ash at the expense of the valuable constituents.

FIRE-CLAY COAL.	Chem. Report Nos. No. 2365	No. 2366
Moisture	7.70	6.66
Volatile combustible matter	35.50	31.00
Fixed carbon	51.96	46.94
Ash	4.84	15.40
	100.00	100.00
Sulphur	.832	.488
Coke (pulverulent)	56.80	62.34
Specific gravity	1.373	1.483
Color of ash	light grayish brown.	purplish gray.

No. 2365. "A much weathered sample of what seems to be a splint coal. Much soiled with ferruginous and argillaceous material."

No. 2366. "A much weathered sample, much soiled with clay, etc. In small pieces."

Fig. 154



The bed with many partings, figure 154, was opened also on Love branch, and, correlated in a former report with the preceding coal, it was used to illustrate the variations which the bed displays. Inasmuch as the rather exceptional upstream dip was probably undiscovered at that time, it may be regarded as an open question if this correlation is correct. Across the ridge from the head of Carr fork down it for some miles on Big branch the Fire-clay coal has been found quite regular in thickness and parting.

The dip continuing through the ridge on the north brings the Hazard coal down to a level likely to provide in

the future a workable area, but it is too difficult of access to receive further consideration now. Though a moderate amount of prospecting for it might enhance the value of the region considerably.

Fig. 155

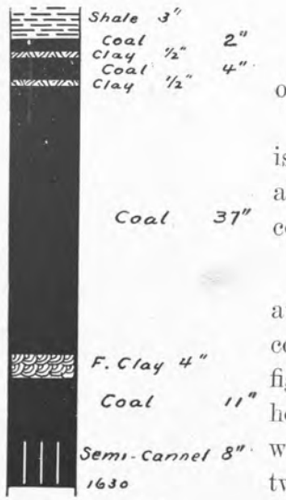
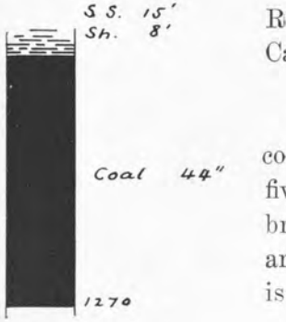


Fig. 156



Big Branch.—On the left, five and one-fourth miles above Camp branch.

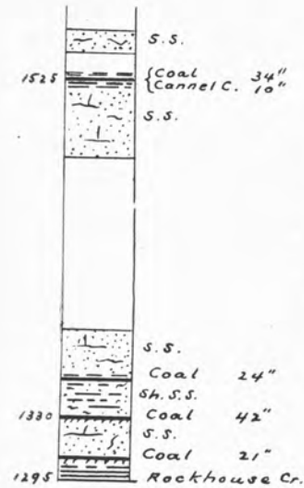
On this branch the Rockhouse bed is at stream level, ¼ mile up it and 50 feet above Rockhouse, elevation 1270, 33 in. coal with five feet shale over it.

On the left, a mile up the branch, at elevation 1630, is the Collins Fire-clay coal, with flint clay parting, shown in figure 155. Its height above the Rockhouse coal exposure, 360 feet, is somewhat less than the actual interval between beds because of the dip in going up-stream. A large area of this coal with excellent thickness can be depended upon in the dividing ridge and spurs between Rockhouse creek here and the head of Carr fork.

Fig. 156 represents the Rockhouse coal at George Cook's entry, just started, five and three-fourth miles from Camp branch and directly under the low gap and road through it to Indian creek. It is 45 feet above the creek, elevation 1270.

Again the Rockhouse bed is opened in an entry of Riley Bentley's, ⅛ mile farther up, at the same elevation, and with the same thickness of coal and same roof.

Fig. 157



In the cliff opposite Bentley's house the bed below the Rockhouse coal, 25 feet above the creek, has the section:

Sandstone	5 ft.
Coal	2 in.
Shale	3 in.
Coal	26 in.

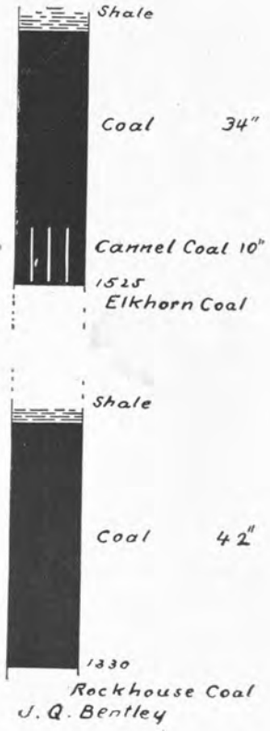
It is a rather poor looking coal as well as thin.

At J. Q. Bentley's, where was formerly Razor Blade P. O. at the mouth of Mill branch, on the left, 7 miles above Camp branch, the section of figure 157 was taken.

The 42 in. coal at elevation 1330 is of the Rockhouse bed, maintaining a nearly uniform height above the creek. It is shown enlarged in figure 158.

The upper coal of the section, and of figure 158, is of the Elkhorn bed, having here, as at the mouth of Potter's fork, a thin seam of cannel at the bottom. A specimen of this cannel, collected by J. A. Shackelford, was analyzed by Dr. R. Peter with the results following:

Fig. 158

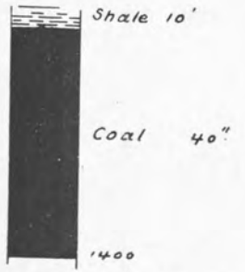


ELKHORN CANNEL.	Chem. Report No. 2364
Moisture	1.90
Volatile combustible matter	39.32
Fixed carbon	51.88
Ash (purplish gray)	6.90
	100.00
Sulphur	1.115
Coke (dense)	58.78
Specific gravity	1.305

"Sample much soiled with argillaceous material. No apparent pyrites. It seems to be a weathered sample."

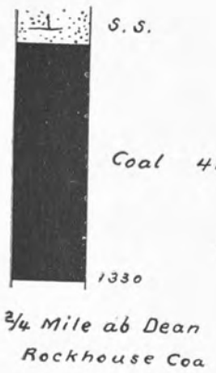
At John L. Bentley's, Dean P. O., opposite the left fork of Rockhouse, seven and one quarter miles above Camp branch, the lower coal, (the Rockhouse) partly opened 25 feet above the creek, shows fully 48 inches of clean coal.

Fig. 159



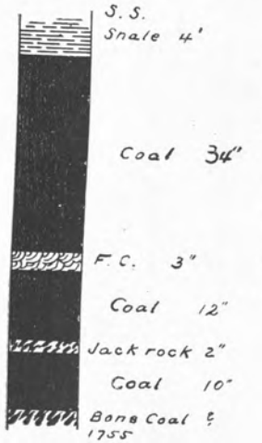
Left Fork.—A half mile up this fork from Dean P. O. a cliff by the road shows the section given in figure 159, the coal at the bottom ten feet above the creek. This is the Rockhouse coal again. A quarter mile farther up stream it is opened in a small entry by the road, five feet above the creek, with about 42 in. coal. Beyond this point it goes below drainage, the creek having a much more rapid descent.

Fig. 160



Right Fork.—At the Splash dam, three quarter mile above Dean P. O., eight miles above Camp branch, the Rockhouse coal is exposed with the section of figure 160. But ten feet above the creek, it must go below drainage a short distance farther up stream.

Fig. 161

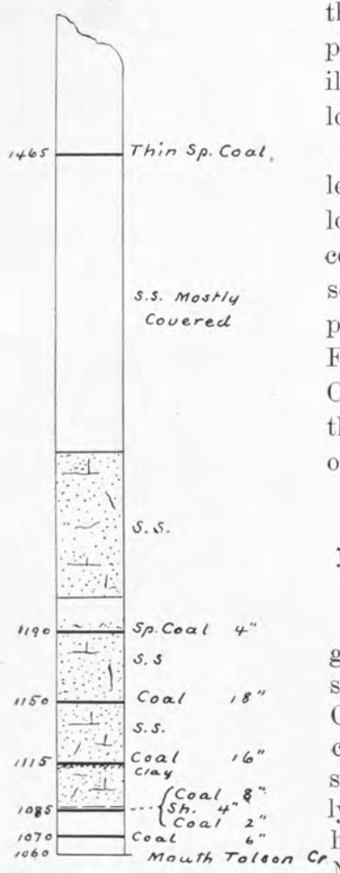


In a left branch near the head of Rockhouse, about ten miles above Camp branch, the Fire-clay coal has been opened in a small entry with the section given in figure 161. The double parting is unusual and the fire-clay is not characteristic, but the identity of the bed can hardly be questioned. The hard bone coal at the bottom appears to be the floor of the bed.

TOLSON CREEK.

A small stream on the right of the river, two miles above Rockhouse creek.

Fig. 162



Section at M. Whittakers

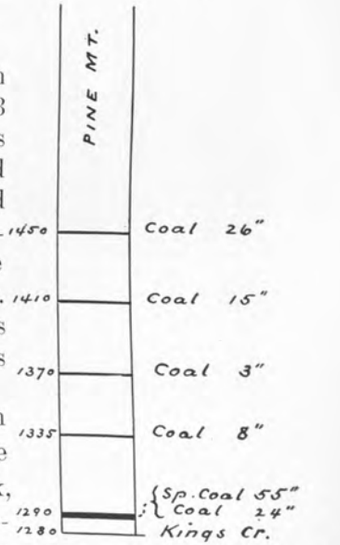
Figure 162, giving a section from this creek, shows little more than the paucity of coal in this vicinity, further illustrated in the section (fig. 135) below Rockhouse creek.

There is little opportunity for, and less reason to expect, good coal in the lower part of the section, the Rockhouse coal being, probably, one of the thin seams near the bottom; and in the upper part of the section the Whitesburg and Fire-clay coals alone give hope of value. One of these is probably represented by the thin splint at elevation 1460. The other should be found.

KINGS CREEK.

The section given in figure 163 shows the Kings Creek, or "Field cannel," coal and seams lying directly over it near the head of the creek. No search was made on this stream for higher beds.

Fig. 163



Section at head of creek

The quite noted coal at the bottom of the section is of the same bed as the Cornett coal (page 127) of Line fork, but here it is of far finer quality. It appears to be a local enlargement of the Elkhorn bed, elsewhere in this vicinity generally thin.

Though called cannel coal but little of it is cannel, though the splint coal has much the appearance of it. It seems to be just about at the transition point. A full length block cut for exposition purposes had no cannel in it, and the measurements of figure 164 were taken from that block. An earlier sample of the bed, taken by Prof. Crandall from a five feet face of splint and cannel, six feet thick, yielded, to Dr. R. Peter's analysis:

Fig. 164

W. D. Jones and Co.

FIELD'S COAL.	Chem. Report No. 2353
Moisture	1.10
Volatile combustible matter	34.30
Fixed carbon	58.10
Ash (light buff-gray)	6.50
	100.00
Sulphur	.890
Coke (spongy)	64.60
Specific gravity	1.292

"A mixed sample, partly of bright pure-looking splint coal, of pitch-black color; partly of tougher, brownish-black, dull, cannel coal some small ferruginous stains on the exterior surface, no appearance of pyrites, and very little of fibrous coal."

SMOOT CREEK.

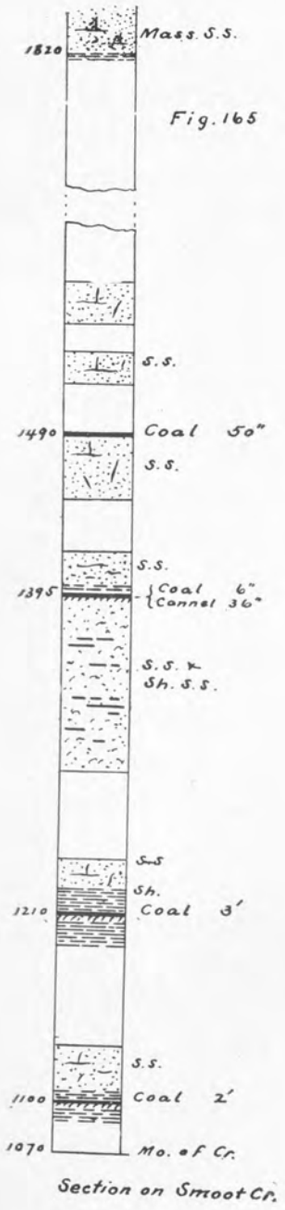
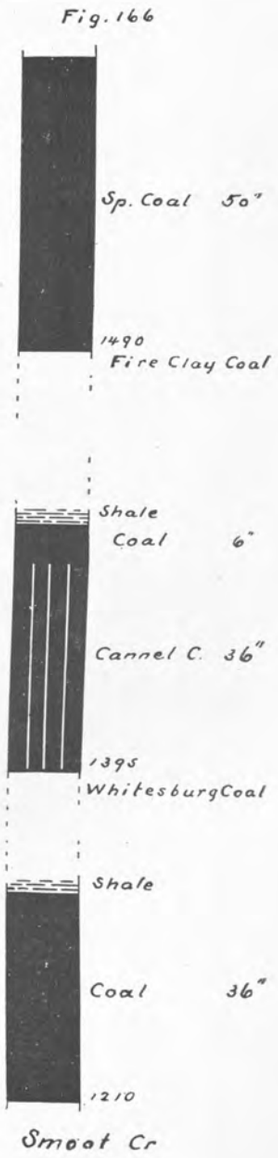


Figure 165 represents a section from near the mouth of this creek to near the top of the hill, on the left about half way up the creek. The three thickest coals are shown on larger scale in figure 166. Rockhouse creek coals furnish a key to correlation here.

The two feet coal near the bottom of the section is probably a part of the Rockhouse bed, which appears in similar form on lower Rockhouse, but it may be of a contiguous higher seam. The three feet coal 110 feet higher, the bottom coal of figure 166. appears to be of an unnamed bed, found nowhere below on North fork waters of workable thickness, thin on Dry creek (the next creek east), but quite constantly workable towards the head of the North fork. However that may be, the 380 feet from the bottom to the top coal corresponds closely with the distance from the Rockhouse to the Fire-clay coal, 410 feet at the head of Camp branch, where about 30 feet deduction should be made for dip. The Smoot creek section was taken, apparently, nearly on the strike and with strata not far from horizontal. The elevations given show a slight dip through the ridge southeast from Blair branch of Rockhouse, due, possibly, to inaccuracy of assumed elevations of streams, from which the heights were obtained. Probably the southeast rise is continuous from Troublesome creek waters, but in this vicinity, and above near the main North fork, it is evidently slight.

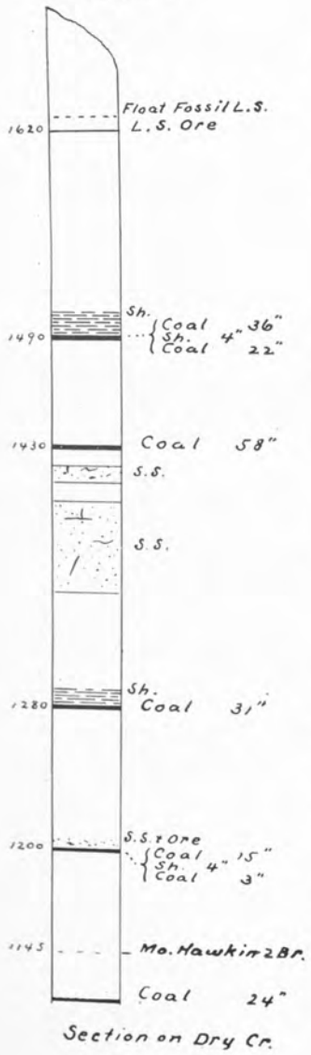


The top coal of the section being of the Fire-clay bed, the coal 95 feet below it, as given in the section, is doubtless of the Whitesburg bed, though the interval is 35 feet greater than should be expected, and than is found on the next creek above. The cannal was found to vary within the limits of the section from 36 in. to 18 in. These two coals are shown on a large scale in figure 166.

With a height of hill of 400 feet or more above the Fire-clay coal, it is not unlikely that small workable areas of the Hazard coal may be found in the ridge north of Smoot creek: South of it there probably are none.

DRY CREEK.

Fig. 167



Section on Dry Cr.

This stream is on the left of the river, three miles above Smoot creek.

Here the section, figure 167, is so like that of Smoot creek that their correlation is almost self-evident.

The 24 in. coal outcropping on the creek below the level of the mouth of Hawkins branch (on the left one and one half miles (?) up the creek) is again probably one seam of the Rockhouse bed.

The 31 in. coal at elevation 1280 is then of the Elkhorn bed, now approaching workable thickness.

The Fire-clay coal is, again, the top bed of the section, showing here a shale parting in place of fire-clay with the largest seam of coal above the parting, as is most common on North fork waters. Its distance from the bottom coal is about right for the interval between it and the Rockhouse bed.

The 58 in. coal at elevation 1430, shown enlarged with the Fire-clay coal

Fig. 168

in figure 168, is of the Whitesburg bed. This opening in connection with those on Little Colly and opposite Whitesburg indicated an important bed in this vicinity, which, though not reliable in thickness deserves full investigation.

The occurrence of a fossil limestone above the Fire-clay bed conforms with findings of the same on Troublesome creek above Trace branch and at several places on Middle fork above Hyden, and on Red Bird creek, Clay County.

COWAN CREEK.

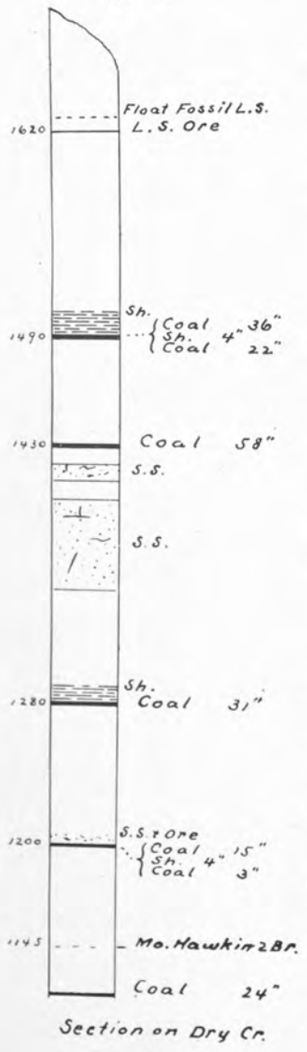
Bert Estis Branch.—On the left, three miles from the river, one mile above Little Cowan.

A half mile up the branch, 110 feet above its mouth, on land of Daniel B. Day, coal has been opened showing the section following:

		Elevation.
Sandstone	5 ft.	
Coal	4 in.	
Shale	4 in.	
Coal	31 in.	1360

DRY CREEK.

Fig. 167



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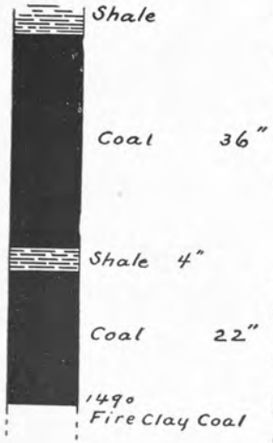
The 31 in. coal at elevation 1280 is then of the Elkhorn bed, now approaching workable thickness.

The Fire-clay coal is, again, the top bed of the section, showing here a shale parting in place of fire-clay with the largest seam of coal above the parting, as is most common on North fork waters. Its distance from the bottom coal is about right for the interval between it and the Rockhouse bed.

The 58 in. coal at elevation 1430, shown enlarged with the Fire-clay coal

Fig. 168



in figure 168, is of the Whitesburg bed. This opening in connection with those on Little Colly and opposite Whitesburg indicated an important bed in this vicinity, which, though not reliable in thickness deserves full investigation.

The occurrence of a fossil limestone above the Fire-clay bed conforms with findings of the same on Troublesome creek above Trace branch and at several places on Middle fork above Hyden, and on Red Bird creek, Clay County.

COWAN CREEK.

Bert Estis Branch.—On the left, three miles from the river, one mile above Little Cowan.

A half mile up the branch, 110 feet above its mouth, on land of Daniel B. Day, coal has been opened showing the section following:

		Elevation.
Sandstone	5 ft.	
Coal	4 in.	
Shale	4 in.	
Coal	31 in.	1360

Fig. 169.

The main seam appears to be a coking coal. A quarter mile farther up, at the same elevation and level with the branch, what appears to be a higher coal is opened to 36 in. thickness at its best, as in figure 169, but it shows also but 26 in. by the side of the thicker coal. No attempt was made at correlation. The coal is at the base of Pine mountain, and was evidently much disturbed by its uplift.

Near the head of Cowan, at elevation 1610, 35 feet above a coal stain in the road to Kings creek, to the right of which it lies, is a rather fine showing of iron ore on a limestone apparently pure, possibly the sub-carboniferous limestone. The deposit appears to be of very small area.

The following analyses by Dr. R. Peter of samples collected by Prof. Crandall are presumably from the Rockhouse bed. No. 2356, from Mr. Nickels' coal-bank, below Whitesburg, on the Kentucky river, Nos. 2358, 2359 the upper and lower seams, respectively, from Caudill's bank, one and one half (or two) miles below Whitesburg, on the Kentucky river. The bed-section of the Caudill bank is given as top coal 25 in., slate parting including a thin coal 8 in. to 14 in., bottom coal 28 in.

	Chem. No. 2356	Report No. 2358	Nos. No. 2359
Moisture	1.84	1.30	1.60
Volatile Combustible matter	33.26	39.60	36.40
Fixed carbon	59.70	55.20	56.60
Ash	5.20	3.90	5.40
	100.00	100.00	100.00
Sulphur	.678	2.812	1.060
Specific gravity	1.286	1.277	1.286
Coke	dense	light spongy	light spongy
Color of ash	lt. buff-gray	brownish	brownish-gray

No. 2356. "A much weathered sample of splint coal. Shows some fibrous coal in the form of reed-leaf-like impressions between the irregular laminae; no pyrites apparent, but a red ochreous incrustation on some of the exterior surfaces."

No. 2358. "Appears to be a pure sample of splint coal, some fibrous coal between the laminae, but no apparent pyrites."

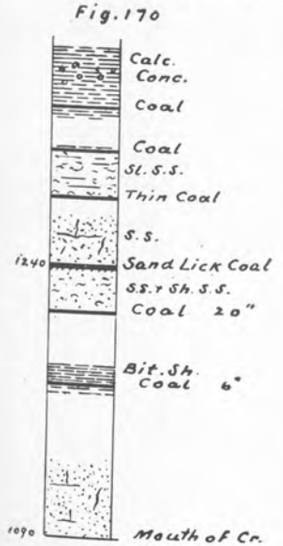
The high sulphur appears to be exceptional: The upper bench of the coal on Sand Lick creek yielded but half as much.

No. 2359. " A weathered sample; approaches cannel coal in some of the laminae."

SAND-LICK CREEK.

The section, figure 170, shows the relation of the lower coals on this creek.

Fig. 170

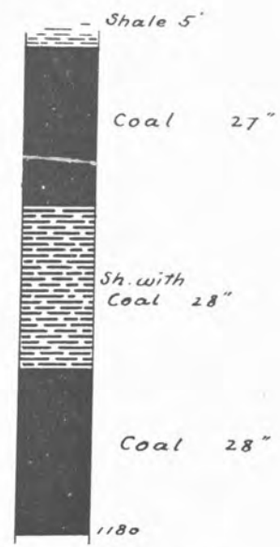


Section on Sand Lick Cr.

The Rockhouse bed is represented in figure 171 as measured lately at the mouth of a small mine on the right, a quarter mile up the creek, 90 feet above its mouth.

In an early report the bed is given the following section:—

Fig. 171



¼ Mile up Creek
Rockhouse Coal

Coal	20 in.	28 in.
Shale	2 in.	16 in.
Coal	30 in.	38 in.

As measured at J. N. Thompson's on Sand-Lick, one and one-half miles from Whitesburg.

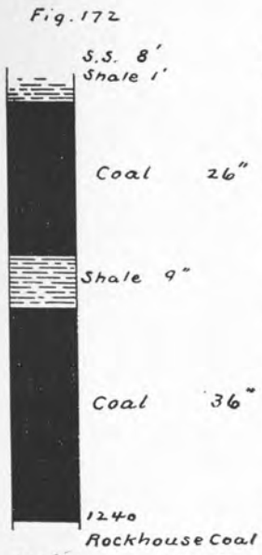
There is little doubt that these openings are all in the same bed, yet it appears that the opening a quarter mile up the creek is 60 feet lower than this one about a half mile up. A part of this difference can be accounted for by barometric inaccuracy, but there is probably a low syncline within a mile of the mouth of the creek.

The upper and lower seams, respectively, of the Thompson coal, sampled by J. A. Shackelford, analyzed by Dr. R. Peter, gave results as shown under numbers 2354, 2355.

ROCKHOUSE COAL.	Chem. Report Nos. No. 2354.	No. 2355.
Moisture	1.10	1.10
Volatile combustible matter	40.90	34.30
Fixed carbon	55.40	57.20
Ash	2.60	7.40
	100.00	100.00
Sulphur	1.453	.889
Specific gravity	1.191	1.279
Coke (spongy)	58.00	64.60
Color of ash	brownish-gray	light gray.

No. 2354. "A pure-looking pitch-black splint coal, quite brilliant on the fractured surfaces and on some of the faces of the laminae. Very little fibrous coal apparent, and no visible pyrites."

No. 2355. "This sample contains some dull layers, with a thin pyritous laminae (sic) and more fibrous coal than in the preceding sample."



About three miles up the creek an opening into the same bed, by the road, at elevation 1210, shows coal and eight partings five and one-half feet thick, but 50 yards farther up the better and more characteristic section given in figure 172 obtains. Beyond this the bed is below drainage.

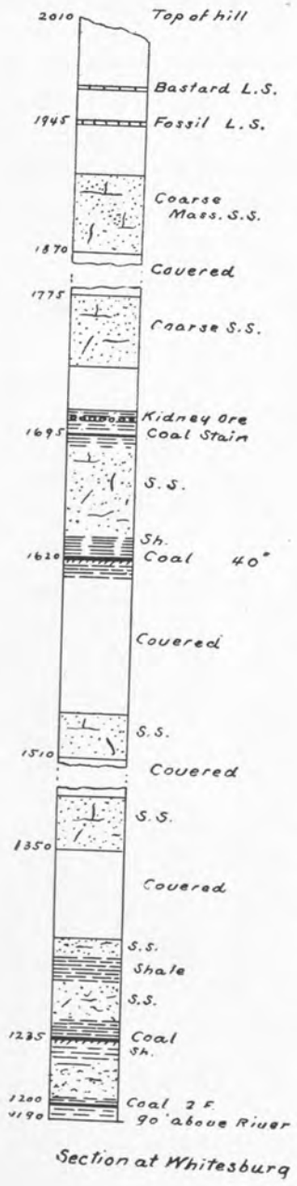
These Sand-Lick sections in connection with those on Colly creek, next above, where the parting is eliminated, give an excellent prospect, doubly valuable, if, as appears, the coal will coke.

The Elkhorn coal shows in the road on the ascent to the gap to Camp branch, probably in two seams, 20 feet apart, the lower seam two feet thick and the upper three to three and one-half feet, the floor, interval and roof, all being shale. The three and one-half feet seam, at elevation 1400, is 190 feet above the Rockhouse bed, and 180 feet below the Fire-clay coal at the head of Camp branch. On account of the dip an addition of 15 to 20 feet should be made to obtain the actual interval—about 200 feet in each case.

WHITESBURG.

Whitesburg, (like Manchester, Clay county), is built mainly on the upper part of the Conglomerate formation, the top of which is 90 feet above the river. The first 40 feet up from the river is a hard sandstone forming the cliff at the upper

Fig. 173



Section at Whitesburg

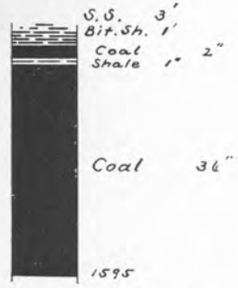
and lower ends of the town. On this is a thin coal above town, cut out in the town itself. Then 50 feet of sandstone, mostly soft, the source, apparently, of abundant pebbles found in the town, but not seen imbedded in the rock. On the sandstone lie 40 feet of yellow shales up to old coal openings into the bed below the Rockhouse (or Sand-Lick) coal.

The latter has not been found in satisfactory condition near town. It is likely that its two seams are split far apart.

Following are notes taken along the road from Whitesburg towards Cowan creek, and a section, figure 173, by Prof. Crandall from the next hollow east, taken before the road was made.

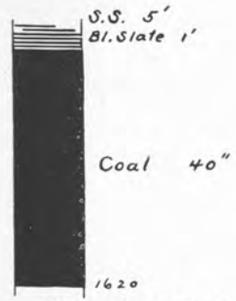
		Elevation.
Road Gap to Cowan		1650
Coal stain in road		1649
Kidney Iron Ore in Road		1645
Shale	2 ft.	
Coal	8 in.	
Shale	8 in.	
Coal	11 in.	1635
Coal (figure 174)		1595
Sandstone		
Shale	3 ft.	
Coal and Shale	8 in.	
Shale	18 in.	
Coal	6 in.	1575
Coal	2 ft.	1220
River		1100

Fig. 174



Road to Cowan Cr.
Whitesburg Coal

Fig. 175



Whitesburg Coal
Frazier

The Rockhouse coal is shown in the figure at elevation 1235, and the Elkhorn coal lies still undiscovered in the blank space, 180 to 200 feet higher.

The Whitesburg coal lies at elevation 1595, opened, as in figure 174, in a small entry on the right under the sharp turn of road near the top of the hill. Unlike its general condition the coal here is mostly soft, and instead of slate the roof is a bituminous shale. In the figure, the 40 in. coal, at elevation 1620, formerly Nickels' Splint, now Frazier mine, is of the Whitesburg bed. Enlarged it is shown in figure 175. The roof here, as almost invariably, is black slate, though not so found on Smoot and Dry creeks.

Prof. Crandall's sample of this coal, mainly splint, from the seven-yard entry, yielded, to Dr. R. Peter's analysis:

WHITESBURG BED. Chem. Report No. 2362	
Moisture	1.34
Volatile combustible matter	34.16
Fixed carbon	56.70
Ash, (chocolate-gray)	7.80
	100 00
Sulphur	1.318
Specific gravity	1.320
Coke	spongy.

"Quite a pure-looking pitch-black coal. Some fibrous coal between the laminae, but very little granular pyrites. Quite a firm coal."

The coal stain in figure 173, at elevation 1695 is probably represented by the 19 in. coal in the road. Either that or the coal in the gap, and perhaps both, is of the Fire-clay coal bed.

The fossil limestone, shown near the top of the section, figure 173, 250 feet above the fire-clay coal found also on Line fork, is of interest as giving possibly an additional clue to the correlation of these coals with those south of Pine mountain. The Fire-clay coal, having been identified as the Dean coal of the Cumberland river, some 400 feet below the fossil limestone there, there is good reason to believe that this fossil limestone will eventually be correlated with that in Harlan county.

At several points in the road between Whitesburg and Colly creek at a height above the river of 60 to 100 feet, floating pebbles indicate (but do not prove) the conglomerate formation. They all appear to have come from friable sandstone, but search for them in the rock itself has as elsewhere been unsuccessful.

COLLY CREEK.

At J. B. Stallard's, on the left of the creek, three-fourths mile up it, the following coals were found:

		Elevation.
Shale	4 ft.	
Coal	23 in.	
Shale with coal	4 ft.	
Coal	9 ft.	1330
Shale	5 ft.	
Reported, Coal	3 ft.	
Reported, Sandstone	3 ft.	
Reported, Coal	2 ft.	1315
Coal	10 in.	1180
Creek		1170

The 10 in. coal appears to be that belonging in the Conglomerate, 40 feet above the river at Whitesburg, and the upper coal of the Whitesburg bed. The intermediate bed may possibly be a slip from the upper. Part of its upper seam only was visible when visited.

Meadow or Long Branch.—On the right, two and one-half miles up.

At James H. Frazier's, on the right, three-fourths mile up this branch the coal of figure 176 is opened in a small entry. It is 710 feet above the mouth of the branch, and 630 feet above a coal showing one-fourth mile up the branch supposed to be of the Rockhouse coal. If so, this is probably of the Haddix bed. There is enough covering to give a fairly good area, and if the intermediate coals prove workable, as seems likely, an unusually favorable locality is existent here.

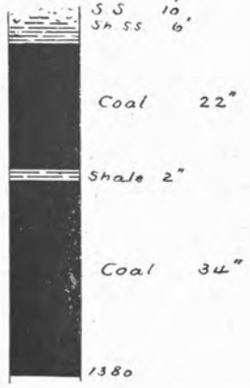
Licking Rock Branch.—On the right, three miles up. A road to Thornton creek follows this branch.

A quarter mile up this branch, at Patrick Blair's, and one-eighth mile up his branch on the left, he has opened the Rockhouse coal, just above drainage, in a 30-yard entry with section as follows:

	Elevation.
Laminated sandstone	10 ft.
Shale	6 ft
Coal	1½ ft.
Soft shale with coal	1½ ft.
Coal	2½ ft. 1380

The bottom was not visible. The roof at the face is shaly sandstone.

Fig. 177

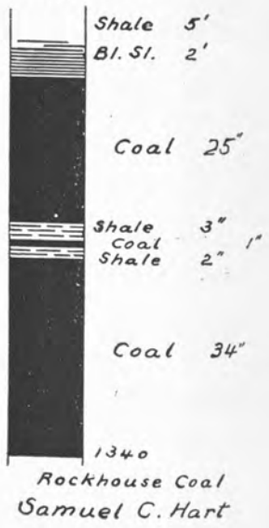


The same bed is opened again at the same elevation, about 20 feet above Licking Rock branch, three-eighths miles from its mouth, by James Pendleton. Its section is shown in figure 177.

The coal has an irregular fracture and much is dull and bony-looking as shown in the dump. It includes a thin streak of cannel and shows much pyrites.

The gap at the head of this branch is so low that all coals above the Elkhorn are cut out by it.

Fig. 178

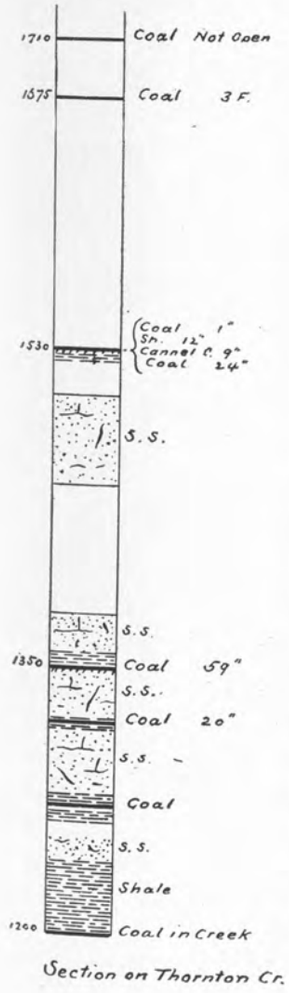


At Samuel C. Hart's, three and one-half miles up Colly, the Rockhouse bed is opened again, 10 feet above the creek, with section as in figure 178.

And, again, at creek level a quarter mile farther up, one-eighth mile up the right fork, at Shade Comb's, where the section is identical, except that the five in. of shale parting has increased to ten in.

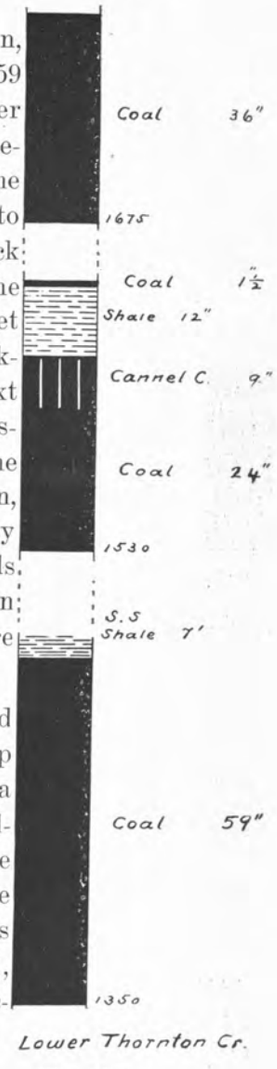
THORNTON CREEK.

Fig. 179



In the section, figure 179, the 59 in. coal of Jasper Craft's entry, one-fourth mile up the creek, appears to be of the Rockhouse bed; the cannel, 180 feet higher, of the Elkhorn bed; the next coal of the Whitesburg bed, and the upper coal shown, of the Fire-clay coal. The three beds opened are shown enlarged in figure 180.

Fig. 180



At one and one-half miles up Thornton, on a branch road to Colly creek, one of the lowest beds of the above section is partly opened, showing the section:

	Elevation.
Shaly sandstone	10 ft.
Coal	20 in.
Shale with coal	4 in.
Coal	15 in. 1315

An eighth mile farther up the road, 100 feet above Thornton, at elevation 1400, the Rockhouse bed is opened, showing about 46 in. coal under three feet of shale.

Fig. 181

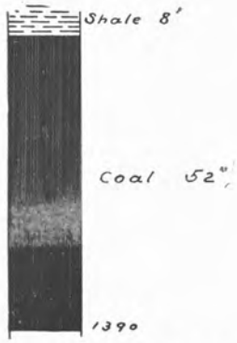
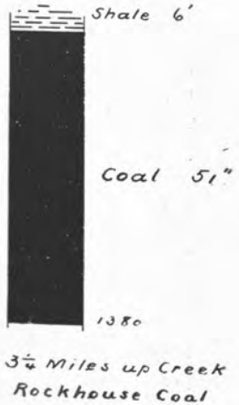


Fig. 182



Numerous other openings have been made into this bed up to where it goes under the creek, three and one-half miles from its mouth, with 51 in. coal, at elevation 1380. Two on the left of the creek remaining open, were measured as shown in figure 181, one and three-fourths miles up, and in figure 182, three and one-fourth miles up.

MILLSTONE CREEK.

Prof. Crandall gives, in an early report, the coal of figure 183, found near the mouth of the creek. He gives it no elevation, but refers it to the Elkhorn bed. If, as it appears, this coal is the same as the Mead coal, near the head of the creek, it must be of the Rockhouse bed, for the latter coal is nearly 400 feet below the Fire-clay coal, lately opened farther up the creek.

Fig. 183

Fig. 184

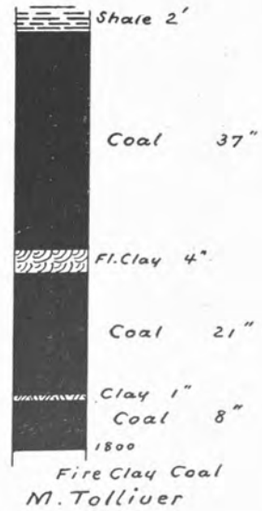
Left Fork.—A mile up this fork, 50 feet above the creek and again one and one-half miles up it, are openings into the Rockhouse bed, each with about 4 feet of coal and both at elevation 1360. The latter is shown in figure 184.

Fig. 185

Right Fork.—Two miles up this fork, on a right branch near its mouth, 15 feet above the fork, at elevation 1405, Meads (?) entry into the Rockhouse bed shows 48 in. coal as in figure 185.

At three miles up is Melvin Tolliver's house. A half mile up the left branch there, 315 feet above its mouth, at elevation 1800, is opened the Fire-clay coal bed as shown in figure 186. It is the farthest up the North Fork of any known opening into this bed. It has a fairly good area here.

Fig. 186

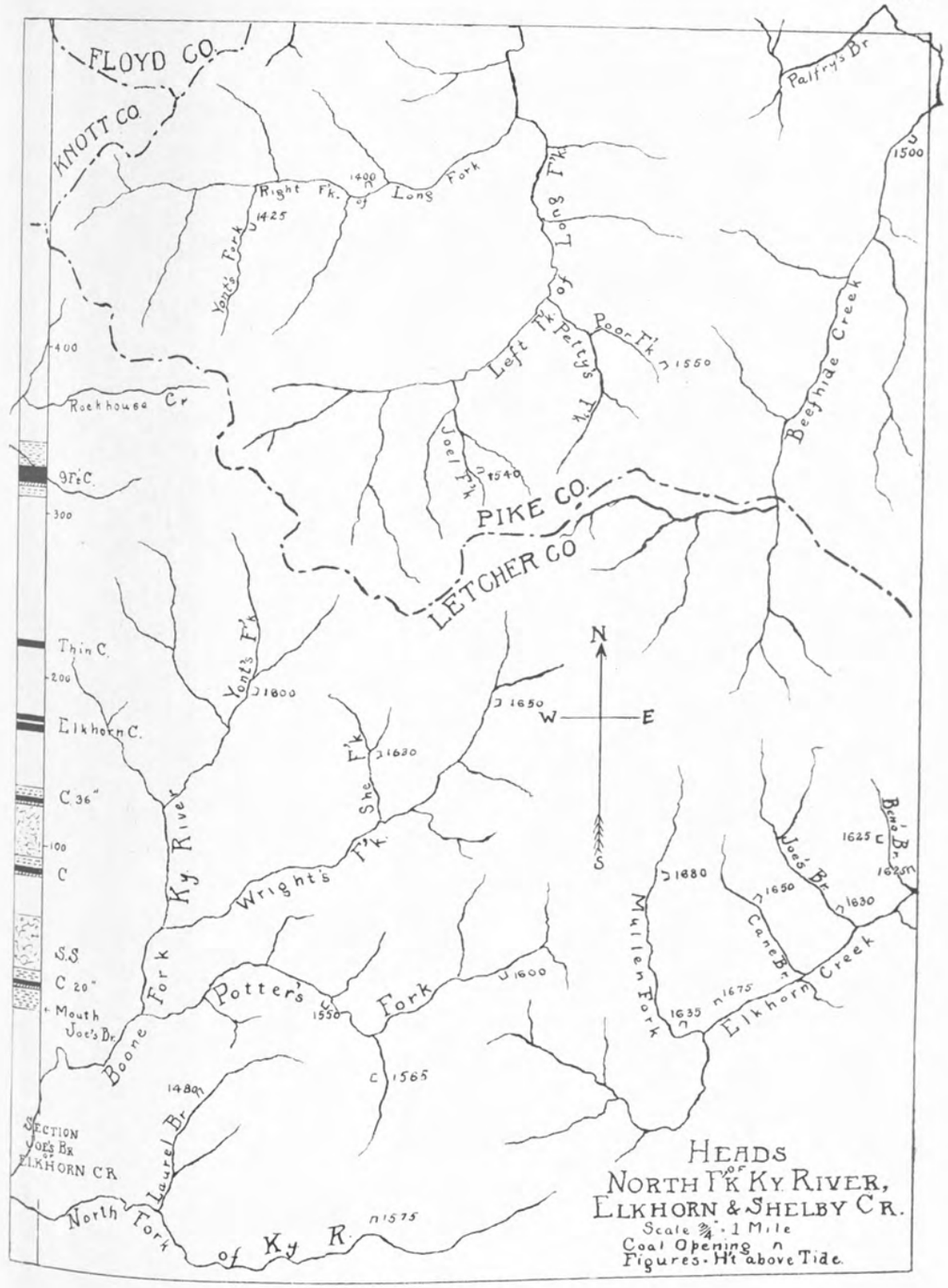


My sample of the coal analyzed by Dr. A. M. Peter, gave:

FIRE-CLAY COAL.	Laboratory No. 2753
Moisture	1.43
Volatile combustible matter	37.00
Fixed carbon	53.35
Ash (buff)	8.22
	100.00
Sulphur	.71
Phosphorus	.007
Specific gravity	1.333
Coke	spongy
Total Carbon	75.43
B. T. U. per pound of coal	13.893

"Average sample. Some pieces iron-stained."

For locating openings on the North Fork waters above Millstone creek reference is made to the page-map following, duplicated from Bulletin No. 4 of the Survey. It is the only map of the region yet published approaching accuracy.



BOONE FORK.

Fig. 188

John Bentley has an opening, one and one-half miles up Boone, one-fourth mile up a branch on the right and 180 feet above its mouth, elevation 1515, represented in figure 188. The lower part of the bed was not seen, but the measurement is nearly exact. It is the first exhibit going up the river, where the Elkhorn coal begins to approach the thickness which, beyond, has made it noted.

At the mouth of Potter's fork, two miles up, this bed is still 180 feet above the stream, elevation 1525. At the mouth of Wright's fork it is opened to over 5 feet thickness, 155 feet above stream, elevation 1520.

Quillan Fork.—This name is applied to the left fork of Boone (or Yonts Fork) a mile above Wright's fork.

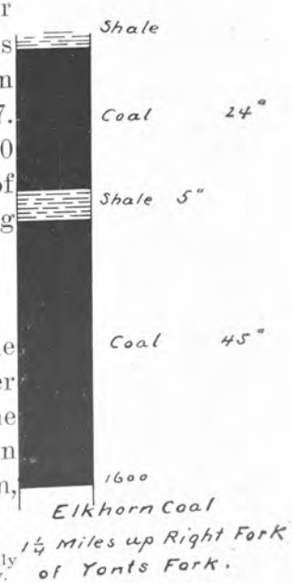
A quarter mile up is an incomplete opening on the right, showing over 3 feet of coal, which, by following by eye the benches up from Wright's fork, appears to be about 80 feet below the Elkhorn coal.

Fig. 189

A half mile up, 100 yards up a branch on the right, this bed is opened at the same elevation, 1470, in an entry 20 feet above the fork, 51 in. coal, as in figure 189. The lower half of the coal is, in part, of irregular cleavage.

The thickness of this coal, its fine shaly sandstone roof, and position relative to the drainage, all make it difficult to believe that this is not the 4 foot bed, so often opened and so constant in character on the three creeks below and on the upper half of Rockhouse, but the uniformity of the results there obtained, viz.: the Elkhorn coal 200 feet and the Rockhouse, 4 foot bed, 400 feet below the Fire-clay coal, establishes that correlation *almost* beyond the possibility of doubt. The conclusion is then forced that this 51 in. bed is one not heretofore recognized on the Kentucky river waters, except on Smoot creek, and is the 36 in. coal of the Elkhorn section on the margin of the page-map, figure 187. The 9 foot coal of that section, 150 feet above the Elkhorn, is evidently of the Fire-clay coal, or of the Whitesburg bed.

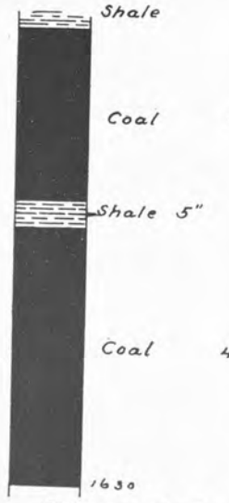
Fig. 190



Yonts (or Yantz) Fork.*—On the right of this stream, one and one quarter miles up and 135 feet above it, is the Elkhorn section of figure 190. An earlier opening, location not given, showed:

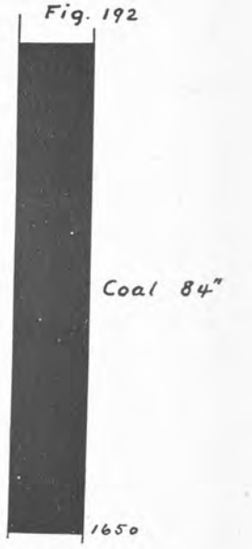
*The following North Fork notes are taken almost wholly from the report of Prof. A. R. Crandall, made for the Survey.

Fig. 191



Coal ---------- 26 in.
Shale ---------- 1 in.
Coal ---------- 35 in.

Fig. 192



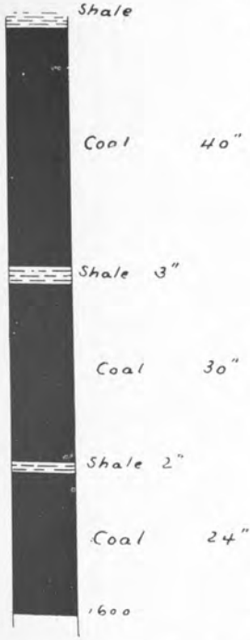
Wright's Fork.—A half mile up the fork, and three and one half miles up the main fork, are the Elkhorn sections figures 191 and 192.

Fig. 193

Potter's Fork.—At Sherman Quillan's, one quarter mile up this fork, 180 feet above its mouth, elevation 1525, an entry partly closed showed over 8 feet of coal, with cannel reported 3 in. thick at the bottom. There is some slickenseit coal, but the cleavage is generally regular. Roof is of shale.

At two miles up, on the right, the section of figure 193 was obtained, 115 feet above stream; at two and one half miles up, one half mile up a right branch, a like section.

Fig. 194



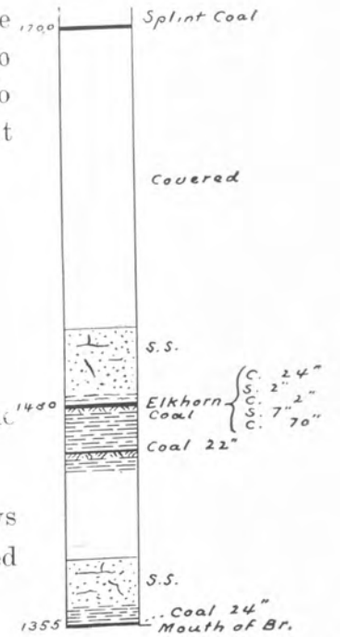
On the right, three and one half miles up and 150 feet above the stream, is the section of figure 194.

The following analyses by McCreath for parties interested, it is stated, are from samples collected with reference to reliable average results.

ELKHORN COAL—POTTERS FORK.
Elevation 1600—Thickness 83 in.

	Coal	48 h'rs coke	72 h'rs coke
Water ---	1.950	0.302	0.170
Volatile C. M.	37.350	1.623	1.135
Fixed C. ------	57.367	91.320	91.731
Ash ----------	2.800	6.165	6.505
Sulphur -------	.533	.590	.459
	100.00	100.00	100.00

Fig. 195



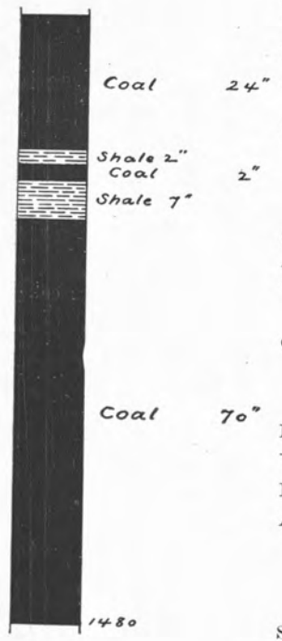
The value of the Elkhorn coal is too well established to require comment here.

LAUREL BRANCH.

On the left, two miles above Boone fork.

The section, figure 195, shows principally the Elkhorn coal, enlarged

Fig. 196



in figure 196, and what is probably the Fire-clay coal, 220 feet above it. The nearness to Pine Mountain appears not to have affected materially the section or the level of the coals.

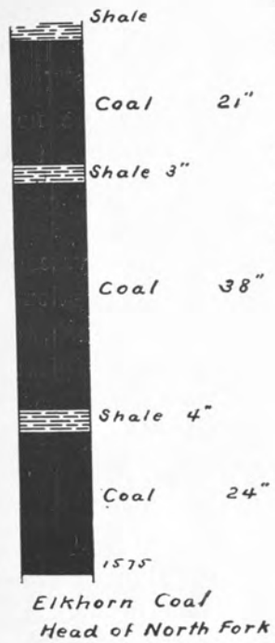
Samples of the coal from Holcomb's collected by Prof. Crandall, analyzed by Dr. R. Peter, yielded:

Chem. Report Nos.	2360	2361
	Upper 2 ft.	Lower 68 in.
Moisture	8.00	2.86
Volatile combustible matter	30.06	31.54
Fixed carbon	57.60	62.10
Ash, (light buff)	4.34	3.50
	100.00	100.00
Sulphur	.494	.535
Specific gravity	1.355	1.319
Coke	pulverulent	dense

No. 2360. "Sample much weathered and somewhat friable, the seams covered generally with a greyish incrustation, part of which seems to be clay, which may increase the apparent ash percentage. Some fibrous coal between the laminae, but no pyrites apparent."

No. 2361. "Generally a bright, pitch-black, pure-looking coal, except in the somewhat weathered portions. A little fibrous coal and fine granular pyrites between the laminae, and a few bright, thin pyrites scales in some of the seams.

Fig. 197



On the left of the river, four miles above Boone the section of Elkhorn coal, figure 197 was taken.

For description of the coal field as it extends down the waters of the Big Sandy river see Bulletin No. 4 of the Survey.

KENTUCKY RIVER.—MIDDLE FORK.

Little prospecting appears to have been done on Middle Fork waters in Breathitt county, or else results were not satisfactory, for on a recent visit to the upper part of the county no new important openings were reported in that vicinity.

It is to be hoped that this paucity is due to want of systematic search, which probably may be aided by the descriptions given in this report of contiguous coals on the North Fork, to which are added for that purpose, rather than as descriptive of the coal region, such notes as have been obtained from along the lower part of Middle Fork.

BEGINNING BRANCH.

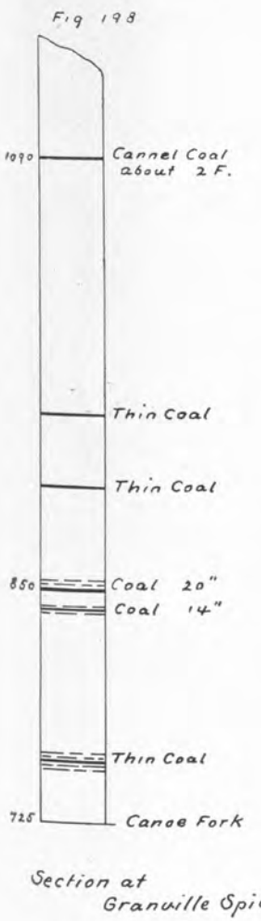
On the left, one and one half miles above the Wolfe-Breathitt county line.

A cannel coal opened at O. Crawford's in what appears likely to prove of the Fire-clay coal, lying 230 feet above the river, elevation 940 feet, was reported 18 in. thick, in two blocks of 7 in. and 11 in. The dip is southeastward, probably about 40 feet to the mile. My specimen of the cannel, stained strongly with iron peroxide, yielded, by analysis of Dr. R. Peter:

CANNEL.	Chem. Report No. 2619
Moisture	1.00
Volatile combustible matter	41.10
Fixed carbon	46.70
Ash (dark gray)	11.20
	100.00
Sulphur	1.120
Specific gravity	1.274
Coke	dense.

TURKEY CREEK.

Fifty-five feet above the mouth of the creek and three quarters mile up it is 16 in. coal in a thick bed of black shale, possibly of the Whitesburg bed, for the cannel of Beginning branch shows again, 25 feet above it, at Isaac Terry's, the following section:



Section at Granville Spicers

		Elevation.
Sandstone	3 ft.	----
Cannel coal	6 in.	----
Coal	14 in.	775
Sandstone	1 ft.	----
Shale		

The up-stream dip is very much reduced here, but this seems to result from a change in its direction to more nearly eastward and across the river. From this point up the river to above Long's creek there is a slight rise of strata.

CANE CREEK.

The section of figure 198 does not promise well for this region, but it was taken over 20 years ago, when it was easy to overlook important coals.

The thin coal at the bottom of the section is nearly in the place of the Fire-clay coal.

The Granville Spicer coal at elevation 1090, likely to be of the Flag coal bed, was reported 20 in. cannel coal under 6 in. bituminous. The cannel coal is of unusually fine appearance, but seems inclined toward a change to bituminous coal.

LONG'S CREEK.

Deacon's coal, ⅛ mile up this creek, 15 feet above its mouth, shows the following section:

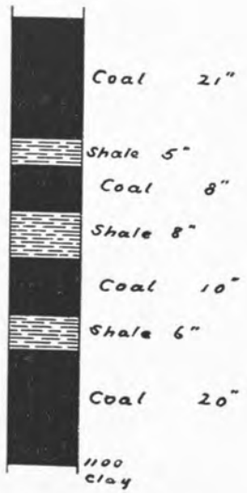
		Elevation.
Shale	5 ft.	----
Black slate	3 ft.	----
Coal	13 in.	----
Shale	1 in.	----
Coal	2 in.	----
Shale	5 in.	----
Coal	8 in.	----

An earlier measurement gave 31 in. coal with 4 in. parting. Its black slate roof is indicative of the Whitesburg bed.

Ground-Hog Branch.—On the left of Long's creek, ¼ mile up it.

The Berry Turner coal of figure 199, ½ mile up the branch and ⅛ mile up a left branch, 250 feet above the preceding, is supposed to be of the Haddix bed. My muddy outcrop sample of the lower 30 in. of this coal, analyzed by Dr. R. Peter, gave the following results:

Fig. 199



Berry Turner

LOWER 30 IN.	Chem. Report No. 2611
Moisture	2.00
Volatile combustible matter	35.36
Fixed carbon	57.36
Ash (white)	5.28
	100.00
Sulphur	1.019
Specific gravity	1.275
Coke	light spongy.

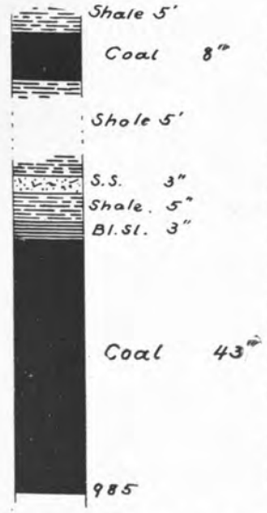
No. 2611. "A pure-looking, pitch-black coal; fracture irregular, with shining surfaces. No pyrites apparent and very little fibrous coal."

The Deacon bed of Long's creek shows along the river road above the creek, and is especially noticeable where it is seen to be wholly cut out in a sandstone cliff about three miles above Long.

At three and three quarter miles above Long, Orville Anderson has opened what appears to be the same bed, without the black slate, 30 feet above the river, one eighth mile up a branch on the left, with the section following:

		Elevation.
Sandstone	5 ft.	----
Clay sandstone	2½ ft.	----
Coal	26 in.	----
Shale	7 in.	----
Coal	5 in.	775

Fig. 200



Henry Johnson
Haddix Coal

At five miles above Long, Henry Johnson's opening, figure 200, into the Haddix bed, is 245 feet above the river.

From this point there seems to be a rapid up-river rise of strata, corresponding to a similar rise on the North Fork between Wolf and Grapevine creeks, and perhaps barely noticeable on Lost creek above Cockerel fork. It may have caused the extreme crookedness of the North and Middle Forks where crossing them, and have resulted in the sudden termination of the high hills south of Little Bullskin on the South Fork.

SQUABBLE CREEK.

A mile up this creek, 305 feet above its mouth, is a bed of some local renown from which the following section was taken:

		Elevation.
Black slate	3 ft.	----
Cannel slate	20 in.	----
Black slate	20 in.	----
Cannel coal	5 in.	----
Black slate		1050

It lies near the level of the Haddix bed, and probably is a local variation of it. In the near vicinity an old opening showed blocks of cannel, thicker than five in., probably from the place of the cannel slate.

On the right of the river, 285 feet above it, one quarter mile above Squabble, is the Peter Gross mine opened into the Haddix bed, figure 201. My sample of it was taken from the face 25 yards underground, and, analyzed by Dr. R. Peter, it gave:

Fig. 201

Peter Gross
Haddix Coal

HADDIX BED.	Chem. Report No. 2795
Moisture	1.90
Volatile combustible matter	37.10
Fixed carbon	57.90
Ash (light purplish gray)	3.10
	100.00
Sulphur	0.749
Specific gravity	1.259
Coke (spongy)	61.00

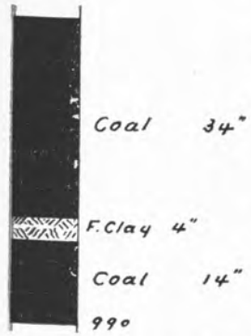
"Generally pitch-black coal, breaking irregularly with irregular shining surfaces, a few pieces dull and laminated. No pyrites apparent, and but very little fibrous coal."

As mined, the coal is of particularly fine appearance; a dull black, hard and strong, and nearly uniform coal, a part of it almost without visible lines of lamination. By general report of the neighborhood it was the finest coal shipped down the Middle Fork, and brought an advanced price in the market. It is perhaps the only bituminous coal from the Haddix bed ever sent down the Middle Fork.

GUYS CREEK.

The Fire-clay coal bed shows its characteristic parting of hard black fire-clay for the first time on Middle Fork at an opening one quarter mile up the creek, 245 feet above the river, with its section as shown in figure 202. My sample of the upper seam was taken from a muddy outcrop and is therefore too high in ash, as analyzed by Dr. R. Peter, his results being given below:

Fig. 202



¼ Mile up Creek
Fire Clay Coal

FIRE-CLAY COAL BED.	Chem. Report No. 2790
Moisture	3.40
Volatile combustible matter	31.00
Fixed carbon	55.30
Ash (very light gray)	10.30
	100.00
Sulphur	0.557
Specific gravity	1.366
Coke	friable.

"Generally dull-black splint coal. Some fine fibrous pyrites and fibrous coal. Portions shining pitch black."

Fig. 203

At two miles up the creek the same bed, 55 feet lower, has a total thickness of 47 in. No fire-clay parting was noticed in it, but the section is probably about as represented in figure 203. The openings of the bed on Eversole branch, North Fork, give good reason to expect a continuous working and nearly uniform section through the dividing ridge.

A mile up the creek, at elevation 805, and therefore about 160 feet below the Fire-clay bed, is a coal 21 in. thick with two in. parting, with floor of shale, containing siderite, and eight feet of black slate roof. This is too far below the former bed to be considered of the Whitesburg, but it may be of the Elkhorn bed. Becoming of workable thickness at intervals farther up the river, it is still of little importance so far as developed, and even if that name is properly applied, it is liable to be misleading as indicative of a deposit of great value.

A mile above Leatherwood and about five miles above Guy's creek, 445 feet above the river, the Haddix coal was opened in 1886 with the section shown in figure 204. My specimen of the ten in. cannel seam, analyzed by Dr. R. Peter, yielded:

Fig. 204

HADDIX CANNEL.	Chem. Report No. 2784
Moisture	0.80
Volatile combustible matter	44.80
Fixed carbon	37.60
Ash (gray-brown)	16.80
	100.00
Sulphur	0.970
Coke	pulverulent.

"A somewhat weathered sample. Ferruginous incrustation on some of the surfaces." This gives an unusually heavy ash for Haddix cannel.

G. B. Barnes, on the left of the river, had, in 1906, a five-yard entry near (or possibly in) the same place. Fallen in, the upper and cannel seams measured about the same as above, and the bottom coal is nearly the same. The bed is covered by a massive sandstone cliff, common to the Haddix, about 40 feet high.

RUSH CREEK.

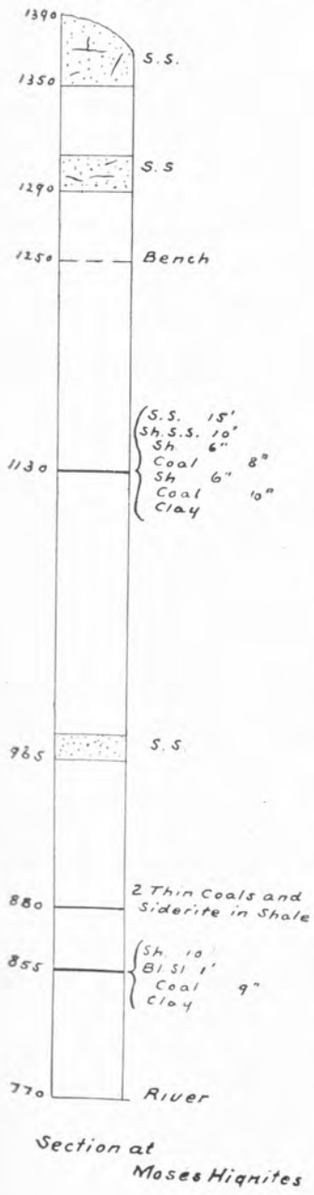
At former William, now James Bowling's a mile up the creek, at its level and 60 feet above its mouth, is the same probable Elkhorn coal found on Guy's creek, with the section here of figure 205, lying on a heavy sandstone. My samples of the two seams taken separately were analyzed by Dr. R. Peter with results following:

Chem. Report.

Fig. 205

	No. 2785 Upper Seam	No. 2786 Lower Seam
Moisture	1.20	1.20
Volatile combustible matter	39.60	35.90
Fixed carbon	52.70	55.30
Ash	6.50	7.60
	100.00	100.00
Sulphur	1.327	0.654
Specific gravity	1.279	1.300
Coke	spongy	spongy
Ash	light lilac gray	nearly white

Fig. 206



Section at Moses Hignites

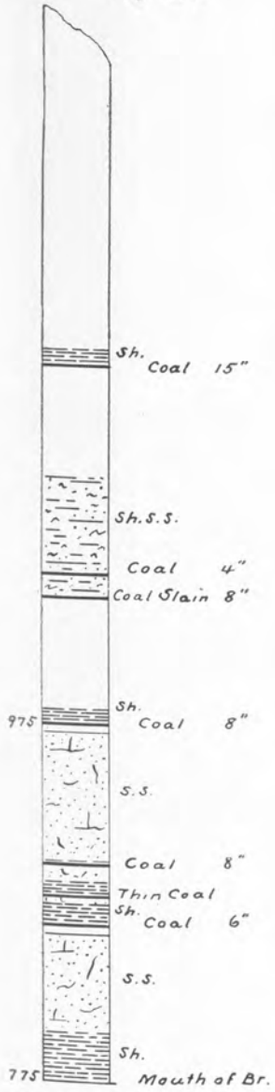
No. 2785. "A pure-looking coal. No apparent pyrites. Some little fibrous coal."

No. 2786. "Resembles (the above,) but is somewhat brighter."

A quarter mile above the mouth of Elkhorn creek, on the river and 70 feet above it, is a 35 in. coal with shale roof, elevation 830, which is probably of the same bed as Bowling's, on Rush creek, the black slate roof not being continuous.

The section of figure 206 was taken at Moses Hignite's near Confluence P. O., five miles above Elkhorn, and may serve as a guide to find coals not yet discovered. That at 855 appears to be of the Whitesburg bed and the Bowling coal is therefore below river level; the Fire-clay coal is about at elevation 920; the Haddix shown at 1130; the Hazard on the bench at 1250; and the Flag coal at about 1325, under the high peaks.

Fig. 207



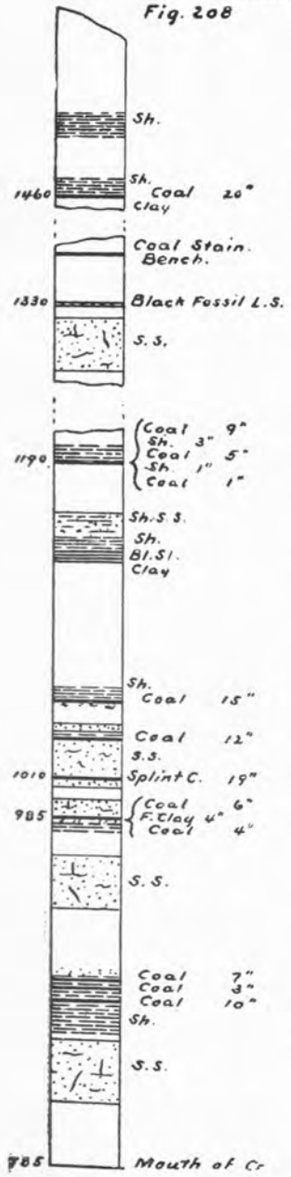
Section on Grassy Br.

GRASSY BRANCH.

In the section, figure 207, the Bowling coal is below drainage. It is evident that the Whitesburg and Fire-clay coals are of no account, the latter belonging at elevation about 900. The Haddix belongs probably on top of the upper sandstone shown in the section; the Hazard bed above the upper coal.

WILDER BRANCH.

On the right of the river, ½ mile above Grassy branch. Thick coal is reported in the river at the mouth of this branch, evidently the same as the Rush creek, Bowling coal. The report is probably true, but there is also a report that this river coal, here or above Cutshin creek, is so cut up by partings and so sulphurous as to be worthless. Cannel coal 8 in. thick, supposed to be of the Haddix bed, is exposed, at elevation not noted, in the midst of massive sandstone. It should be some 350 feet above the river.



Section on Hell for Certain

PEACH-ORCHARD BRANCH.

On the right, one and one half miles above Grassy branch.

The only note taken on this stream was of a hard, black, fossiliferous limestone five feet thick, at elevation 1330, on the head of the branch. It was found 345 feet above a Fire-clay coal opening with strata lying probably nearly level between the two points. It is shown in the section, figure 208. Considerable work has been done upon it in a futile search for silver ore.

No similar deposit, so thick and at such height, on Kentucky river waters, is known to the writer, but that found opposite Whitesburg by Prof. Crandall, about 250 feet above the Fire-clay coal may possibly be of the same character and bed; that on Line fork appears quite different. The Peach-Orchard limestone probably lies between the Hazard and Flag coal beds.

HELL-FOR-CERTAIN CREEK.

The section given in figure 208 is representative (like some other sections given) only of what it shows. Thick coal has been found on the creek since it was taken.

From the bottom of the section up to the Fire-clay coal at elevation 985 considerable reduction should probably be made in vertical distances, because of the rise of strata in the horizontal distance covered, that coal opening being on

Devil's Jump branch, two and one half miles from the mouth of the main creek. A less reduction should be made on the remainder of the section, carried one and one half miles farther up the creek. The down stream dip is probably about at the rate of 20 feet per mile.

The Fire-clay coal rider, 19 in. splint coal, is noticeable here for the first time on Middle Fork. Farther up it becomes quite important.

The Haddix bed is represented at elevation 1190, and the Hazard bed, probably the thick one of more recent discovery, was not found.

The limestone is referred to on page 185, and the coal shown just above it is of the Flag coal bed.

In the low gap, five miles up, at the head of Bullskin creek the sandstone often forming cliffs over the Haddix coal is peculiarly conspicuous.

OLDHOUSE BRANCH.

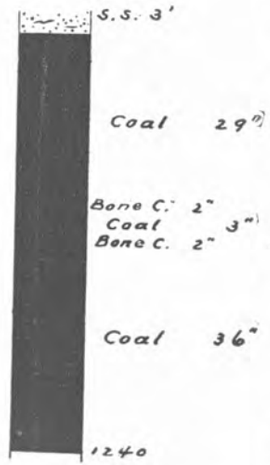
On the left, one mile above Hell-for-Certain creek.

A quarter mile up, a quarter mile up a left branch, and again, on the right, three quarter miles up main Oldhouse, the latter five feet lower than the former, has been opened the Haddix bed, with the sections following:

		Elevation.
Earth		----
Coal stain	6 in.	----
Clay	8 in.	----
Coal	4 in.	----
Shale	7 in.	----
Coal	14 in.	----
Bituminous shale	1 ft.	----
Covered	7 ft.	----
Hard splint coal	17 in.	1330
Clay	1 ft.	----
Coal	6 in. ±	----
Yellow earth		----
Clay and shale	1½ ft.	----
Hard splint coal	14 in. ±	1325

More digging in the latter would probably have developed the higher seams where only yellow earth appeared.

Fig. 209



On the left, a mile up Oldhouse, 20 feet above it and 450 feet above its mouth is the Henry Begley, ten-yard entry into the Hazard coal, shown in figure 209. My sample of this coal was analyzed by S. D. Averitt, for the Survey, with the results below:

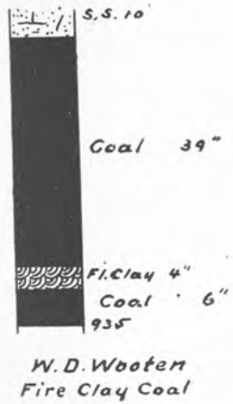
HAZARD COAL.	Laboratory No. 2734
Moisture	1.91
Volatile combustible matter	38.29
Fixed carbon	52.45
Ash (light buff)	7.35
	100.00
Sulphur	0.74
Phosphorus	0.023
Coke (dense spongy)	59.80
Specific gravity	1.299
Total carbon	73.62
B. T. U. per pound of coal	13.613

"This should be a fairly good coking coal." It is a hard coal, with considerable mixture of splint, little injured by the bone coal included.

CUTSHIN CREEK.

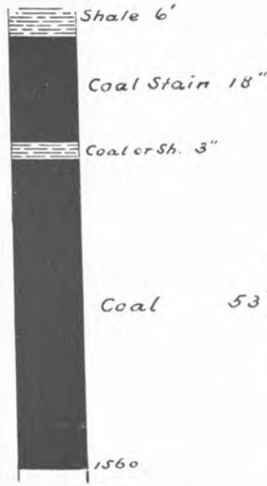
No investigation has been made of the coals on this creek near its mouth, but at W. C. Wooten's, on the left, two miles up, the Fire-clay bed has been opened, 100 feet above the creek, at elevation 915. It is reported 3 feet of coal on 3 in. of fire-clay and 1 foot of coal under it.

Fig. 210



Mackintosh Creek.—But one opening is known on this creek, which gives the main road from Hyden to Hazard. It is at W. D. Wooten's, an entry on the left, at the mouth of the creek and 115 feet above it, at elevation 935. It is shown in figure 210. The flint-clay parting varies from 4 in. to 7 in. The coal is mostly a good rich-looking block coal with a little splint and an inch of bone.

Fig. 211



Feckley Branch.—On the right of Cutshin, one mile above Mackintosh creek.

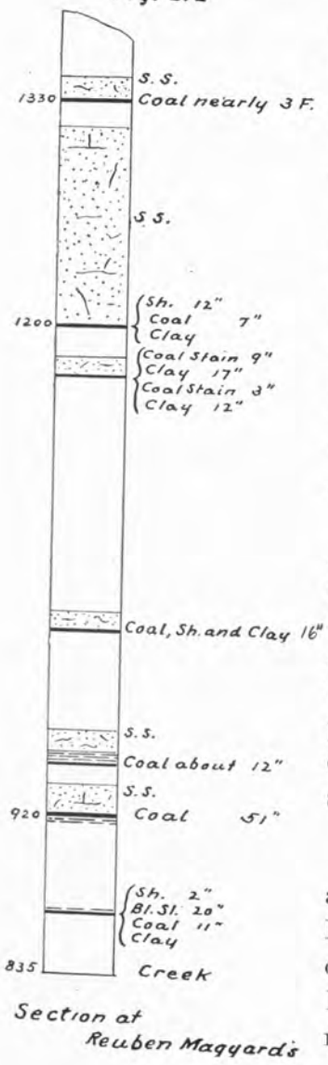
Hart Branch.—On the right, one and one quarter miles up Feckley branch.

The following section was obtained here:

Hilltop	1620
Hindman coal bed	1560
Flag coal bed	1460
Fire-clay coal bed	1015
Mouth of Hart branch	960

The opening into the Fire-clay coal bed, at stream level one quarter mile up Hart branch, had fallen in so that the coal was not visible. The coal above it, at suitable elevation for the Flag coal, imperfectly opened, gave 22 in. coal under massive sandstone with 5 in. shale and clay between. Under the coal is about 18 in. shale (with some coal included,) the bottom of the cut not visible.

Fig. 212



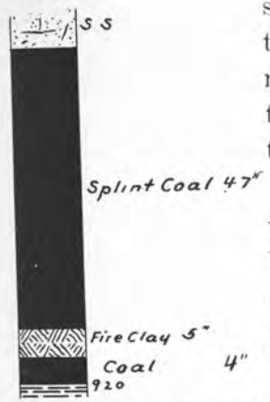
Section at Reuben Magyard's

The opening into the Hindman bed, figure 211, showed a full face, but the parting, if such it is, has so much bitumen in it that there is reason to doubt if it be not coal. Though carrying 6 feet of coal, the bed is here of no value because of its restricted area, nor does there appear to be much greater area anywhere in the vicinity.

The three openings, all on land of Jonathan Hart, being near together and nearly in the direction of the line of strike, give close approximation to the actual distances apart of the several beds, 535 feet from the lower to the upper here corresponding with the interval of 530 feet found on the head of Troublesome creek, Right Fork.

The section of figure 212 was taken about two miles above Mackintosh creek. Here the Whitesburg coal, at the bottom of the section, is found 55 feet below the Fire-clay coal at elevation 920. The rider to the latter is also shown.

Fig. 213



Reuben Magyard Fire Clay Coal

Apparently a thickening of the sandstone on the Hazard coal has cut the latter, at elevation 1200, down to almost nothing, but the Flag coal at the top of the section is more nearly of normal thickness.

The 51 in. coal of the Fire-clay bed was found at John C. Lewis', and its bed-section is given in figure 213. My sample of the coal from solid outcrop yielded, to analysis by Dr. R. Peter:

FIRE-CLAY COAL.	Chem. Report No. 2535
Moisture	2.00
Volatile combustible matter	31.00
Fixed carbon	59.94
Ash (nearly white)	7.06
	100.00
Sulphur	0.665
Coke (spongy)	67.00
Specific gravity	1.319

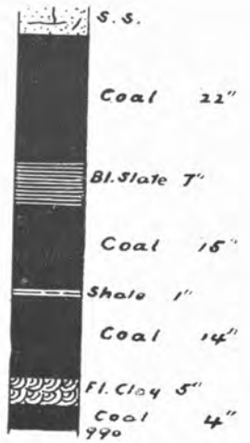
Fig. 214

J. C. Brewer Fire Clay Coal

"A portion of the sample is in pure-looking, pitch-black fragments, breaking irregularly, with shining surfaces; another portion is dull-black and irregularly laminated. Very little fibrous coal and no pyrites apparent. * * * A weathered sample, as its considerable proportion of moisture indicates. No doubt it gives more ash than will be found in the unweathered coal."

A mile farther up the creek, and 80 feet above it, is the J. C. Brewer opening into the Fire-clay coal, shown in figure 214.

Fig. 215



Minter Bailey
Fire Clay Coal

Fig 216

Fire Clay Coal
2½ Miles up Creek

Wooten Creek.—At Minter Bailey's, one and one half miles up this creek and one quarter mile up a branch on the right, near water level, is the Fire-clay coal opening of figure 215.

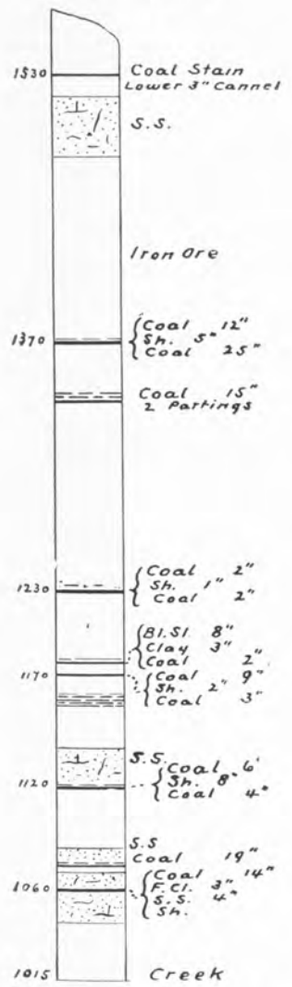
On the same branch one and one half miles up and on the Right Fork, at John Melton's house, is a big bench, at elevation 1320, probably marking the location of the Hazard coal. A 20-foot sandstone cliff is exposed directly above it. At elevation 1560 Melton's opening at the head of the Right Fork, fallen in, is said to have 7 feet of coal, underlaid by 2 feet of coal and shale. Without correction for dip, which is doubtless very slight, this bed is 570 feet above the Fire-clay coal. It is therefore of the Hindman bed, with an apparent interval from the Fire-clay bed 35 feet more than on Feckley branch, a difference possibly due to barometric inaccuracy but more likely to thickening of strata.

On the main creek, 25 feet above it, at the school house two and one half miles up, the outcrop of the Fire-clay bed gives the section of figure 216.

At John Bailey's, at the mouth of Cane branch, three miles up, an entry, five feet above the stream, at elevation

1010, has been made into the upper seam of the Fire-clay coal, 38 in. thick, without parting and with massive sandstone roof. Beyond this the bed soon goes below drainage.

Fig. 217



Section of Chris. Lewis'

Polecat Branch.—On the left four miles up Wooten creek.

On the right, one half mile up this branch, some 40 feet above it, at elevation 1220, the Haddix bed shows cannel coal in an old opening, fallen in. Another opening, 40 feet higher, also closed, though unusually close to the Haddix seems to be of the Hazard bed.

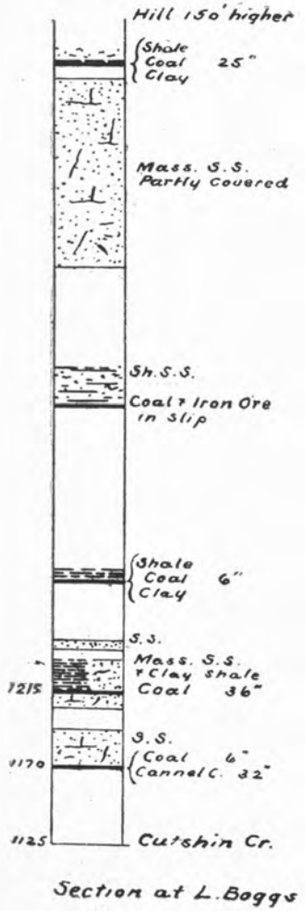
Coon Creek.—

Wolf Creek.—The section of figure 217 was taken from Christopher Lewis' house, a mile up the creek, along it for a mile above the house. The Fire-clay coal at 1060 has its usual parting, but the clay is not as pure as usual. The whole bed is cut out by sandstone in a neighboring rock-house. The Haddix bed appears to be represented by the splint coals at elevation 1170. The Hazard bed was probably not discovered, but the 37 in. coal at 1370 may be the Flag-coal; it is all very bright, the lower eight in. splint coal. The coal at 1530, though rather low for the Hindman bed, and containing cannel, seems likely to be of that bed, as its stain

"A much weathered and soiled sample of what looks like a bituminous shale."

The light rise of strata up the creek, which is shown by the foregoing openings into the Fire-clay coal, continues at the rate of about 20 feet per mile to near its head.

Fig. 221



Section at L. Boggs

At three miles above Paul's creek, on the left, 60 feet above the road and 130 feet above the creek, the rider is opened with:

		Elevation.
Shaly sandstone	7 ft.	----
Coal	1 ft.	----
Shale	1 ft.	----
Coal	1½ ft.	1130

At four and one half miles above Paul, five feet above the creek, what is either the Fire-clay coal or bed below it shows.

		Elevation.
Massive sandstone	4 ft.	----
Shaly sandstone	4 ft.	----
Coal	6 in.	---
Splint coal	12 in.	1085

If this is of the Fire-clay coal a roll has carried it down 50 feet below the level to which a uniform rise would take it.

Figure 221 represents the section found six miles above Paul's creek, and

Fig. 222

L. Boggs

figure 222 its two principal beds, the Fire-clay coal and its rider. The former, though rare as cannel on the Middle Fork is quite common as such on the North Fork; and the rider has cannel to the southwest on Greasy creek and elsewhere. A quarter to half mile farther up, at the mouth of Mud Lick, and 80 feet above it, elevation 1230, there is 32 in. clean coal probably belonging to the Fire-clay coal rider. Over it is three feet of shale.

Laurel Fork.—In the creek at the mouth of this fork is 29 in. coal under massive sandstone roof, which appears to be also of the Fire-clay coal rider.

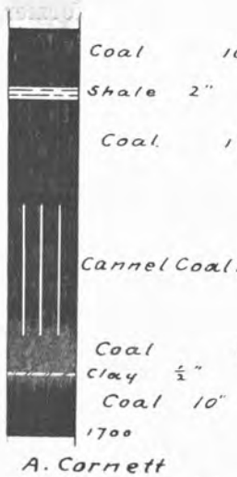
In a rockhouse one quarter mile up the fork, 170 feet higher than its mouth, the following section is exposed:

		Elevation.
Massive sandstone	20 ft.	----
Coal	9 in.	----
Shale	1 in.	----
Coal	4 in.	----
Bituminous clay shale	5 in.	1420
Fire-clay	3 ft.	----

While this seems likely to be of the Haddix bed more knowledge of the coals of the vicinity is requisite for its determination.

Three miles up Laurel fork, one eighth mile to the left up Wolf-pen branch, and 50 feet above it on the right, is

Fig. 223



the Arch. Cornett opening shown in figure 223. Assuming a rise of strata of about one per cent up Laurel fork would bring this coal into position of the Hazard bed, and such it probably is, conforming with the deductions as to coals on Leatherwood creek. Just across the ridge from this opening is one into the same bed on the head of Clover fork of Leatherwood, containing 5½ feet of nearly clean, mainly soft coal.

Of the following analyses of coal from this opening Nos. 2532-3-4 were by Dr. R. Peter, and Nos. 2738-7 by Dr. A. M. Peter, all from my samples, the former collected from the solid outcrop in 1885, the latter from two yards underground in 1906. In No. 2737 the 6 in. bituminous coal was included because of no visible cleavage, the whole 29 in. appearing to form one solid block.

HAZARD (?) BED	Chem. Report Nos.			Laboratory Nos.	
	2532	2533	2534	2738	2737
	Upper 10 in. &Lower 10 in.	18 in. Seam	Cannel	Upper 10 in. &next 18 in.	Cannel & 6 in below
Moisture	1.80	1.60	0.60	1.67	1.56
Volatile com. matter	34.60	32.06	45.30	38.78	46.94
Fixed carbon	57.70	61.24	47.20	53.91	45.16
Ash	5.90	5.10	6.90	5.64	6.34
	100.00	100.00	100.00	100.00	100.00
Sulphur	1.055	0.737	0.683	1.34	0.72
Phosphorus	-----	-----	-----	0.004	-----
Coke	spongy	spongy	dense	dense spongy	dense
Specific gravity	1.243	1.243	1.255	1.290	1.225
Color of ash	brown gray	light brown gray	light brown gray	light brown	buff
Total carbon	-----	-----	-----	76.65	74.56
B. T. U. per pound of coal	-----	-----	-----	14.142	14,142

No. 2532. "A portion of the sample has irregular laminated structure, showing very little fibrous coal and no apparent pyrites; another portion breaks with irregular fracture and shining surfaces; is pitch black and pure-looking."

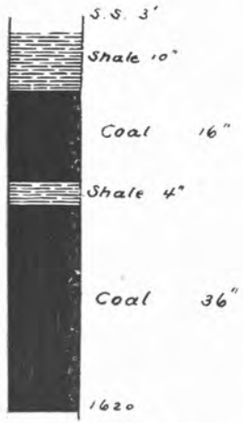
No. 2533. "Mostly a pure-looking, pitch-black coal with irregular shining fracture. Some portions are irregularly laminated and more dull in appearance. Very little fibrous coal and no pyrites apparent."

No. 2534. "A very tough, dull-black coal. Fracture very flat, imperfect conchoidal. No apparent fibrous coal or pyrites. Some parts of the sample somewhat soiled with clay."

No. 2738. "Average sample of soft, bright coal, somewhat weathered and with some ferruginous incrustation.

No. 2737. "Average sample, mostly cannel, _____but with a small proportion of soft, bright, pitch-like coal."

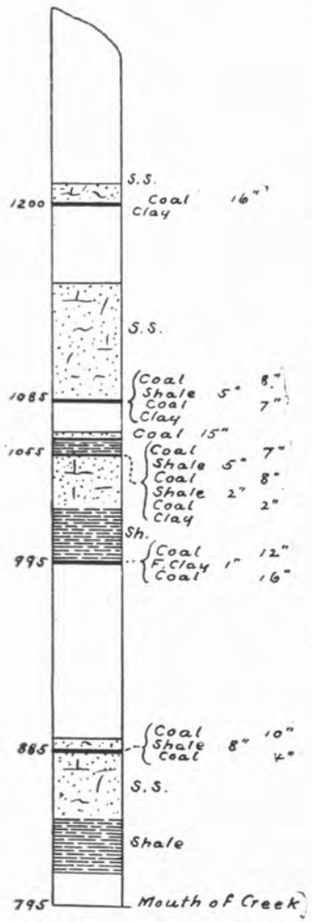
Fig. 224



Guthrie Fork.—On the left one and one-half miles above Laurel Fork.

A half mile up this fork and one quarter mile up its Right fork, in a field on the right, at elevation 1620, is the coal of figure 224. It is probable that this does not represent quite the full thickness of the bed as the opening was partly covered when visited, and only the visible coal was measured. With a like allowance for rise of strata as for the Laurel fork opening, this one also comes to the level of the Hazard bed, to which it is referred with little doubt.

Fig. 225



Section near mouth of Bull Creek.

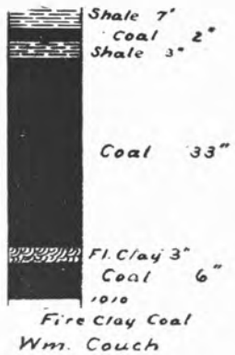
Figure 225 represents a section taken near the mouth of Bull creek. Coal is reported as having been taken from the river bottom along here, from a bed about 9 feet thick, but including so much shale and sulphur as to be almost worthless. Its location corresponds well with the Bowling coal on Rush creek, below, and such thickness as was reported tends to correlation with the Elkhorn coal, and adds interest to the bed in this region. The thin coal lowest in the section is noticeable as being worked one and one-half miles above Bull creek. The Fire-clay coal with its one in. parting is barely distinguishable, at elevation 995 and the rider is either absent or is in the much split coal above it in the section. Apparently the 16 in. coal at the top is the Haddix coal, but further search for this bed is desirable before final conclusion.

ONE MILE BRANCH.

On the right, one and one half miles above Bull creek.

On the left, one quarter mile up the branch, William Sisemore has opened, in a five-yard entry, the lowest bed of figure225 with 30 in. clean coal with laminated sandstone roof, elevation 875.

Fig. 226



NIGHWAY BRANCH.

On the right, one and three quarter miles above Bull creek.

A quarter mile up, 205 feet above the river, Bart. Sisemore has opened the Fire-clay coal with the following section, shale and bone coal here taking the place of the usual parting.

		Elevation.
Shale or shaly sandstone	5 ft	----
Coal	2 in.	----
Shale	½ in.	----
Coal	31 in.	----
Shale	½ in.	----
Bone coal	1 in.	----
Coal	11 in.	1010

On the right of the river, two miles above Bull creek the William Couch opening, at the same level as the preceding, gives the section of figure 226, in which the flint clay is black and looks much like coal.

ASHER BRANCH.

On the right, four miles above Bull creek and two miles below Hyden.

Of the two openings on this branch shown in figure 227, the lower is of the Elkhorn bed, giving its maximum thickness in this region, so far as seen. Considerable coal was shipped down the river in former times from the entries here, 50 feet above the river and one eighth mile from it, but they are now all fallen in. They are known as the Asher mines. My

Fig. 229

James Lewis
Fire Clay Coal

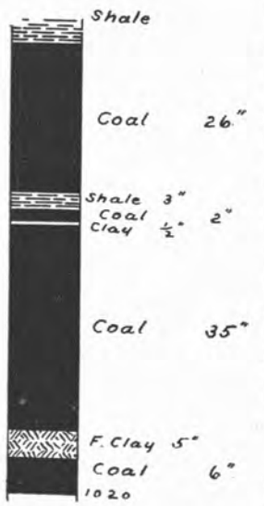
	Elevation.
Sandstone ---------- 10 ft.	----
Shale ---------- 2 ft.	----
Coal ---------- 27 in.	----
Clay ---------- ½ in.	----
Bony coal ---------- 5 in.	875

The main seam looks like a coking coal, and the bony coal at the bottom not bad.

The section at the mouth of the James Lewis mine in Hyden is given in figure 229. The upper seam, a block coal, alone is mined, and the flint clay and coal below are given as reported by a miner there. At the face, some 150 yards in, the main coal is 51 in. thick. A test of the coal, over night in the grate, showed it to be non-coking.

The coal is delivered by incline upon the main street of the town, and in view of the fact that here is the only coal incline now on either of the three forks, and that the bed is well developed here, the name of Hyden is particularly appropriate to it. Though often called the Sizemore coal in this vicinity, it is quite generally known as the Fire-clay coal bed throughout the whole region, and hence that name is used in this report. It is the Dean coal of the Jellico and Cumberland river regions.

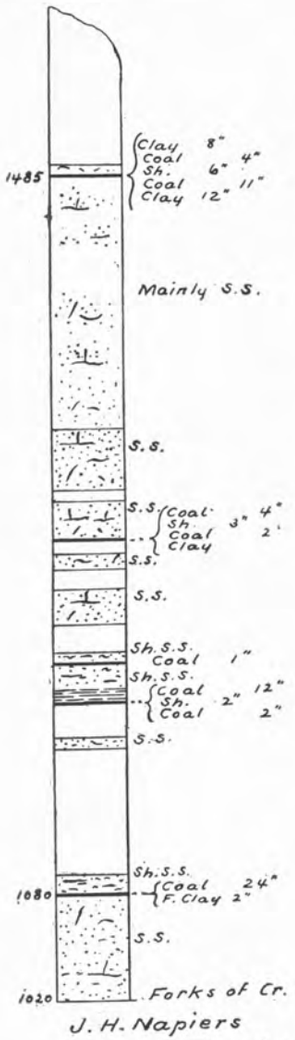
Fig. 230



Wm. Sisemore
Fire Clay Coal

The bed-section of figure 230 is from two miles above Hyden and one half mile up a right branch. The elevation obtained is probably too low.

Fig. 231



J. H. Napiers

The upper seam of coal may be here the rider to the bed, making the whole of unusual thickness.

My sample of the upper 63 in. of this coal gave to Dr. R. Peter's analysis:

FIRE-CLAY COAL.	Chem. Report No. 2737
Moisture	0.74
Volatile combustible matter	36.06
Fixed carbon	54.00
Ash (grayish brown)	9.20
	100.00
Sulphur	1.307
Coke (spongy)	63.20
Specific gravity	1.279

"A pure-looking firm coal, generally breaking irregularly, with irregular surfaces. A portion with lamellar fracture, and some fibrous coal; no pyrites apparent."

At the Joseph Lewis' opening, 3½ miles up the creek, 100 feet above it on the left, the fire-clay parting and coal below it were reported, but not visible, the main seam is reduced to 31 in., and the rider, with 25 feet of shaly sandstone between, is 22 in. thick.

At the forks, four miles up, and thence up the Left fork the section of figure 231 was taken.

The Fire-clay coal, at elevation 1080, still diminishing in thickness, gives little promise of anything beyond, yet on its

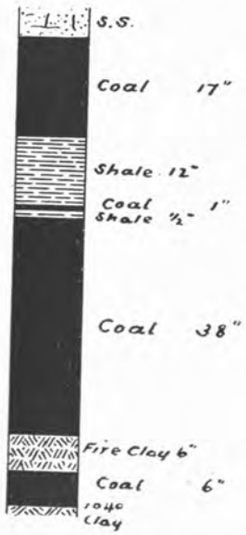
first appearance across the ridge, and at intervals on Red Bird creek, it has good thickness.

Other coals of the section are quite as unpromising, but one thick coal may have been missed. The Hazard bed, 300 feet above the Fire-clay coal has 7 feet of coal across on the head of Sugar creek. The Haddix bed at 1280 and Flag bed at 1485, if such they are, are of no avail here.

HURST BRANCH.

The Asher coal shows again, ¼ mile up this branch, 40 feet above the river, with the following section:

Fig. 232



John Lewis Fire Clay Coal

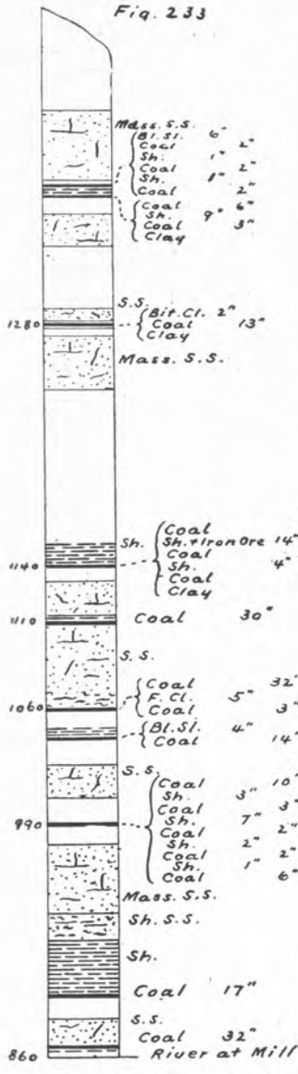
		Elevation.
Shaly sandstone	10 ft.	----
Coal	27 in.	----
Shale	3 in.	----
Coal	8 in.	886

And ½ mile up, 200 feet above the river, the Fire-clay coal as in figure 232. The lower parting is an impure fire-clay; the main coal in part splint, and the upper seam of coal possibly the rider.

It is said that fossil limestone from this branch was used for making lime for the Hyden courthouse, an unusual instance of the utilization of such material. The position of the quarry relative to the Fire-clay coal is not known, but is probably 150 to 200 feet above it.

A mile above Hyden, at Morgan's, 200 feet above the river, the Fire-clay coal has the following section:

Fig. 233



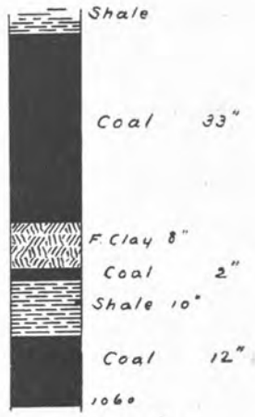
Section at Jno. Bowlings

		Elevation.
Coal, sandstone and shale	3 ft.	----
Coal	30 in.	----
Fire-clay	5 in.	----
Coal	5 in.	1045

At two miles above Hyden the section of figure 233 was taken, in which the Fire-clay coal is again 200 feet above the river. The 17 in. coal near the bottom, with its shaly sandstone roof, appears to represent the Asher mine coal, with perhaps the 32 in. coal, which has two thin partings, an offshoot from it.

The ribbed coal at elevation 990 is in position of the Whitesburg bed, but the black slate over the next seam above seems to designate that as at least a part of the Whitesburg, though abnormally near the Fire-clay coal at elevation 1060. A second opening, at Bowling's, of the Fire-clay coal gives the section shown in figure 234.

Fig. 234



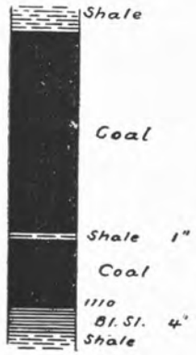
Jno. Bowling Fire Clay Coal

Of the higher beds the Haddix appears not to have been

found (under its massive sandstone), and the Hazard bed, highest in the section shows pretty thorough disintegration.

BURNT CAMP BRANCH.

Fig. 235



Jesse Morgan Fire Clay Coal

The Fire-clay coal of figure 235 is 210 feet above the river.

My sample of coal from this opening analyzed by Dr. R. Peter gave:

FIRE-CLAY COAL.	Chem. Report No. 2738
Moisture	0.70
Volatile combustible matter	34.70
Fixed carbon	55.20
Ash (light purplish gray)	9.40
	100.00
Sulphur	0.983
Coke (spongy)	64.60
Specific gravity	1.291

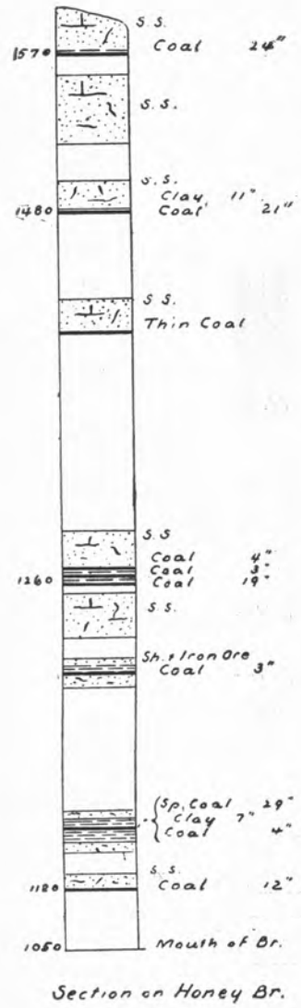
These results are remarkably close to those of the Sizemore coal, Rockhouse creek, page 203. "The sample seems to have more splint coal."

From this creek up, the river becoming more rapid, the Fire-clay coal gradually approaches it.

GREASY CREEK.

At Elias Howard's, three miles up the creek and 30 feet above it, the Whitesburg (?) bed has 31 in. coal under sandstone roof and with a cliff immediately below it. A 12 in. coal under shale lies 40 feet higher, possibly the lower seam of the Fire-clay coal.

Fig. 236



Section on Honey Br.

Lick Branch.—On the right, 3¼ miles up Greasy creek.

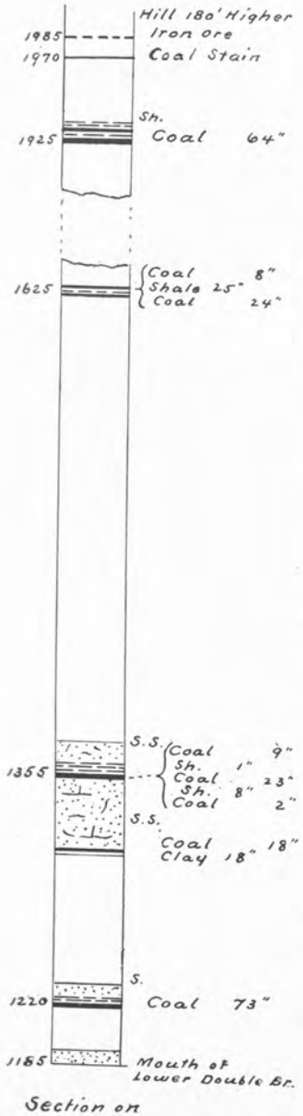
Also at Elias Howard's. The Fire-clay coal on this branch is 24 in. thick, with impure fire-clay floor and 30 feet sandstone covering. Elevation 1130. A half mile up the branch, elevation 1255, is 21 in. coal under 15 feet massive sandstone.

Honey Branch.—On the right, 5¼ miles up Greasy creek.

In the section, figure 236, either the lowest coal or the next to it is of the Fire-clay coal, but the parting of the latter is soft and white, instead of flint-clay. In either case the thin coal at elevation 1410 is of the Haddix bed, or a part of it. The next coal is probably of the Hazard bed, and the 24 in. coal at the top is of the Flag coal bed.

On Carnegie branch, North Fork, below Hazard, iron ore lies in shale 100 feet above the Fire-clay coal, as in this section.

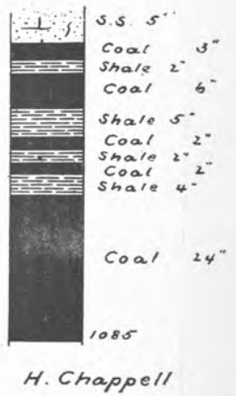
Fig. 238



Elk Branch.—On the right, 7½ miles up.

The Henry Chappell opening, figure 237, ¼ mile up Elk and 20 feet above its mouth, is probably of the Fire-clay coal, with perhaps, the rider included. The bottom 24 in. is wholly splint coal.

Fig. 237



Laurel Fork.—On the right of Greasy creek.

Feds Branch.—On the left, ½ mile up Laurel Fork.

A quarter mile up this branch, 40 feet above its mouth, the following section was obtained.

		Elevation.
Shaly sandstone	15 ft.	----
Shale	7 ft	----
Coal	28 in.	----
Fire-clay	6 in.	----
Coal	6 in.	1140
Shale		----

The fire-clay parting returned here to its normal condition.

Upper Double Branch.—On the right, 2½ miles up Laurel fork.

The section taken on this branch, shown in figure 238.

gives, doubtless, the Fire-clay coal and its rider in the 73 in. coal at the bottom, though the fire-clay parting is again wanting or altered here.

The coal at elevation 1355 is probably the same as that found on Line fork, Perry county, considered a split down from the Haddix bed.

The coal at elevation 1625 cannot now be correlated though it comes about in the place of the Flag coal as found farther down stream.

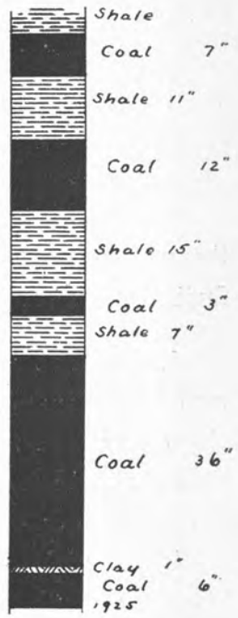
The coal at elevation 1925 is believed to be of the Hindman bed, although by barometer 705 feet above the Fire-clay coal, instead of about 500 feet as in Perry county. But little of this increase can be accounted for by barometric error or by pitch of strata. Either a new bed above the Hindman is discovered here, or a thickening of strata southward between the Hindman and the Fire-clay coal has occurred, and, assuming the thick coals found high on the hills here, on White Oak creek (on the left of Greasy next above Laurel fork) on Oldhouse branch (lower Beech fork) and on Reuben branch and at Kate Spring (Beech fork, near head) assuming these to be of one bed, a constant increase of interval toward Pine mountain is evidenced. This in itself is almost conclusive proof that the assuption is correct and that this upper coal is of the Hindman bed.

Fig. 239

N. and McC. Schell
Fire Clay Coal

Figure 239 represents, enlarged, the lowest coal of the section, and figure 240 the upper opening. My outcrop samples of the three lower seams of the Fire-clay coal, and of the two lower seams of the upper bed, analyzed by Rr. R. Peter, yielded.

Fig. 240



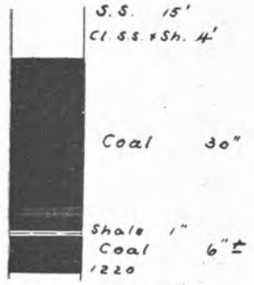
N. and McC. Schell
Hindman Coal

	Fire-clay Coal	Hindman Bed
Chem. Report No.	2733	2734
Moisture	3.20	1.72
Volatile com. matter	29.70	35.68
Fixed carbon	57.50	51.20
Ash	9.60	11.40
	100.00	100.00
Sulphur	0.626	1.367
Coke	dense	light spongy
Color of ash	light brownish gray	light purplish
Specific gravity	1.342	1.363

No. 2733. "A weathered and somewhat soiled sample of what seems to be a good coal."

No. 2734. "Seems to be a splint coal. Sample somewhat weathered. Some little fibrous coal, but no pyrites apparent." The coal will probably make good coke, and there is a fair working area of it in this vicinity.

Fig. 241



¼ Mile above
Upper Double Br.

Figure 241 represents either the Fire-clay coal or its rider as opened where going under Laurel fork. The lower seam of coal was partly covered, and further exploration is necessary to disprove the presence of such thick coal as was found at the mouth of Lower Double branch.

Gill Branch.—On the left, five miles up Laurel Fork.

At 540 feet above the forks of Laurel at Incline P. O., the following section was obtained of a coal probably somewhat under the Hindman bed, opened on the Gill branch side of the spur.

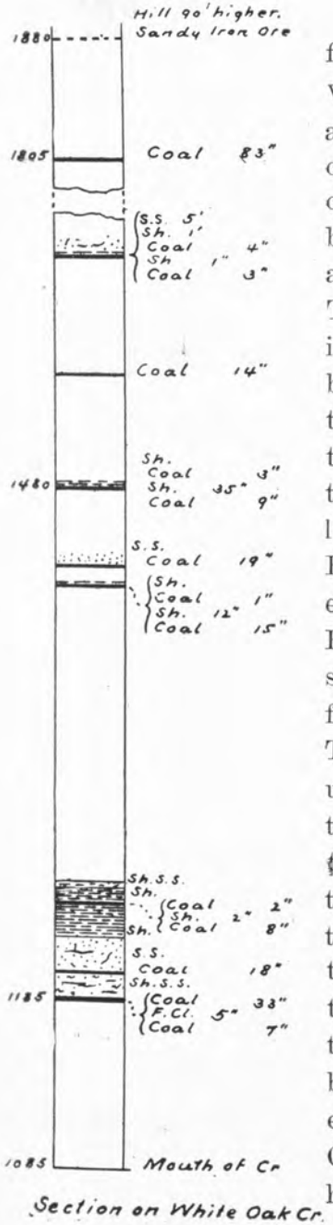
Fig. 242

Forks at Incline

	Elevation.
Sandstone.	----
Shale containing iron ore 4 ft.	----
Coal 9 in.	----
Shale 16 in.	----
Coal 32 in.	1990

On the left of Laurel fork at the town of Incline, five feet above the forks, elevation 1455, is the coal of figure 242, possibly of the lower Haddix bed. It is a slickenseit coal rich in bitumen and rather heavy in ash.

Fig. 243



White Oak Creek.—The section of figure 243 was taken along the creek, via Pace Trace up to the head of Coon and Upper Bad creeks. The Fire-clay coal near the bottom is shown again in figure 244. The rider appears in the long section, but thence to the top coal correlation is uncertain, though it seems likely that the Hazard bed lies at elevation 1480. Figure 245 represents this bed as found above John Turner's, 3½ miles up the creek, and the following in tabular form shows the variations in this bed and the two below it, and of intervals between them, which occur within a short distance, C. K. York's being about 1½ miles below Turner's. A reversal of the general direction of dip is also indicated. Correlated coals are between the same horizontal lines.

Fig. 244

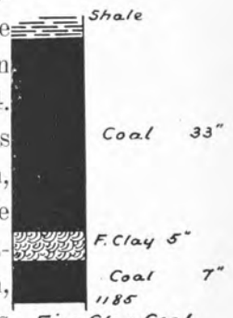
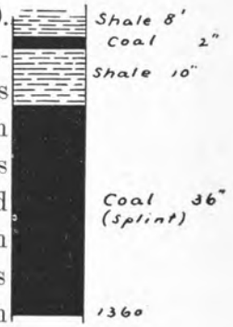


Fig. 245



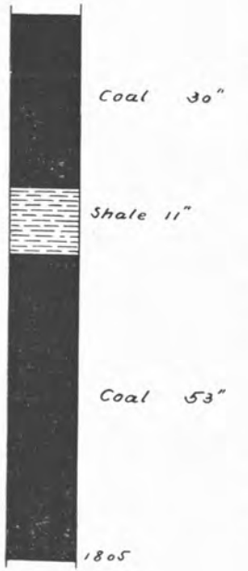
At C. K. York's, 2 Miles up Creek.	½ Mile up Left Fork From J. Turner's.	¼ Mile up Right Fork From J. Turner's.	¾ Mile up Right Fork From Turner's
Shale..... 3″ Coal..... 3″ Shale.....35 Coal..... 9	8′ Shale Coal..... 2″ Shale .....10″ Sp. coal.....36 Clay	Heavy coal stain	Shale.....4″ Coal.....3″ Shale.....9″ Coal.....9″ Clay
Elev.....1,480	Elev. 1,360	Elev. 1,390	Elev. 1,440
45′ { 35′ Covered 5 Sandstone 4 Shale 1 Sandstone		20′ Covered	20′ Covered
Bitum. coal, 19″		Bit. coal and can. sl. 9″	Bit. coal.....14″
8′ { Covered Shale		7′ Covered 2′ Yellow shale	9′ { Shale Covered 2′ yellow shale
Coal..... 1″ Shale.....12″ Sp. coal.....15″		Block Bit. c. 17″	Coal.....8″ Shale.....2″ Coal.....4″

Strata exposed below York's show a rise up stream considerably in excess of the average, and it is believed that near and above his house an anticlinal axis of an unusually large roll, running southeast, crosses the creek and determined its course, so nearly contrary to the direction of the general drainage.

Pace Trace.—On the left, two miles up White Oak creek. The coal at the top of figure 243, shown in detail in figure 246, found at the head of the Trace, may be slightly above its normal position on account of this roll, and it appears in the section higher above the Fire-clay coal than its normal interval

because of the actual rise of strata. This rise would suffice to bring the upper coal into position to correlate with the Hindman bed, which it undoubtedly belongs to, as its bed-section and relation to the hill-top both imply, but a part of the 625 feet difference in elevation of the openings in the two beds is attributable to an increase in thickness of strata between them.

Fig. 246



The opening made into the upper bed was not carried far enough to reach solid coal, and my sample of the lower 53 in., which seemed to be of fairly good coal, analyzed by Dr. R. Peter with results as given below, is, doubtless, considerably too high in ash:

HINDMAN BED.	Chem. Report No. 2736
Moisture	9.40
Volatile combustible matter	32.20
Fixed carbon	48.80
Ash (nearly white)	9.60
	100.00
Sulphur	0.433
Coke (pulverulent)	58.40
Specific gravity	1.509

"A weathered sample of what seems to be a good splint coal."

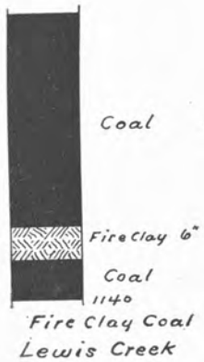
Tantrough Branch.—On the left, one mile above White Oak creek.

Cannel coal, reported 46 in. thick, has been taken from openings on this branch, one eighth mile up, five to ten feet above it, and 50 feet above Greasy creek. It appears to have come from the Fire-clay coal rider, though the sandstone under it looks like that under the main bed.

Lewis Creek.—A half mile up, 35 feet above the mouth, the Fire-clay coal was opened with the section of figure 247. The upper seam is in part splint, inclined to slickenseit. My sample yielded to Dr. R. Peter's analysis:

FIRE-CLAY COAL.	Chem. Report No. 2735
Moisture	1.72
Volatile combustible matter	35.02
Fixed carbon	57.60
Ash (light brownish gray)	5.66
	100.00
Sulphur	0.599
Coke (spongy)	63.26
Specific gravity	1.251

Fig. 247



"A somewhat weathered sample of what seems to be a good splint coal."

The rider to this bed, opened 25 feet higher, has 13 in. good cannel coal on 10 in. bituminous, under shale roof.

Fossil limestone reported in the creek one eighth mile up the right fork is apparently less than 100 feet above the Fire-clay coal.

Fig. 248

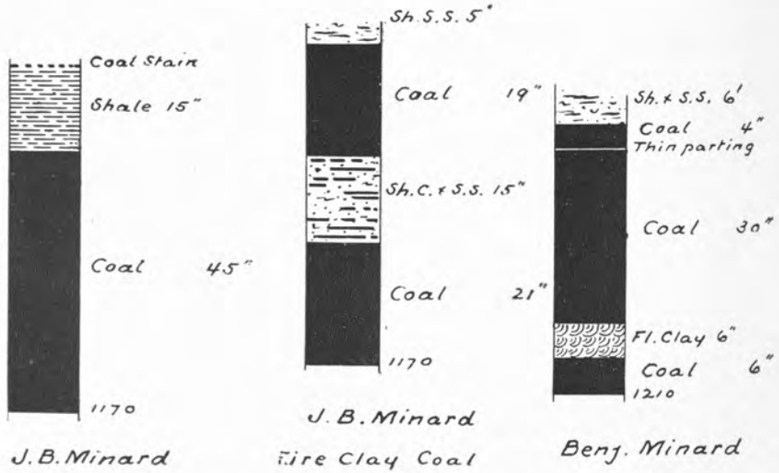


Figure 248 represents in the 45 in. seam a part of the Fire-clay coal at an opening on the left, 30 feet above Greasy creek and three quarters mile above Lewis creek.

Neither roof nor floor was visible. The same bed is opened on the right, 25 feet above Greasy and a mile above Lewis creek, with the bed-section shown in the middle of the figure. Again the floor was covered, but the 21 in. coal at the bottom was evidently the full thickness of that seam—less than half that in the preceding opening. On the right of the figure is shown the whole of the Fire-clay coal as opened opposite the mouth of Abner's branch, 10 feet above it. The main parting is here a true flint clay.

Abner's Branch.—On the right, two miles above Lewis creek.

Fig. 249

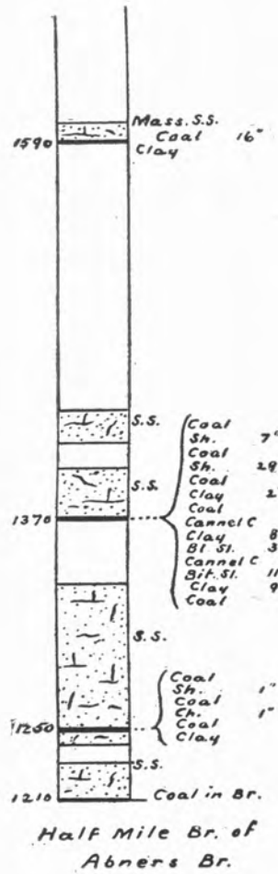
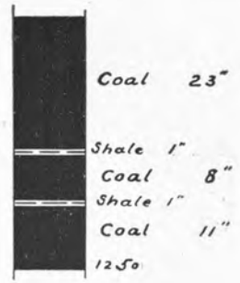


Fig. 250

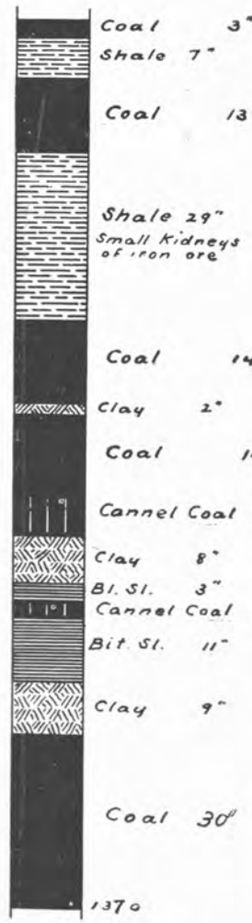


Coals found on the right, one-half mile up Abner's branch, are shown in figure 249. It appears likely that the lowest coal, shown again in figure 250, is of the Fire-clay coal bed, and that an intrusion of sandstone has carried the rider (with its cannel coal) to elevation 1370, far above its usual distance from the main bed. Comparison with the Gabe's branch coals, following, supports this view.

Muddy outcrop sample of the three thickest bituminous seams of coal in the higher bed figure 251 and including also the seven in. cannel seam, analyzed by Dr. R. Peter, yielded:

FIRE-CLAY COAL RIDER (?)	Chem. Report No. 2538.
Moisture	5.10
Volatile combustible matter	24.70
Fixed carbon	52.00
Ash (light buff)	18.20
	100.00
Sulphur	0.725
Coke (pulverulent)	70.20
Specific gravity	1.505

Fig. 251



"No doubt this coal will be found to give less ash deeper in the bed, where it has not undergone the process of weathering. But, even with its more than twenty-three per cent. of ash and moisture, it yet contains more than seventy-six per cent. of combustible matters, and hence it may be available for fuel, in many cases, in the vicinity of the mine."

Gabe's Branch.—On the right, four miles above Lewis creek.

On the right, one eighth mile up this branch and 25 feet above its mouth, at elevation 1325, is 20 in. coal under 15 feet or more of sandstone, which seems to be one seam of the Fire-clay coal, though possibly of its rider.

In the branch, one half mile up, at elevation 1325, nearly up to the level of the variegated bed on Abner's branch, which also carries black slate, is the following section, which may be correlated with that on Abner's branch.

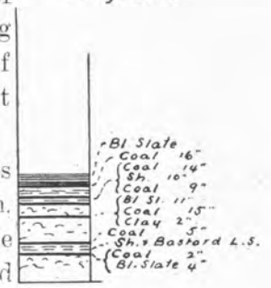
Laminated sandstone	10 ft.
Shale	4 ft.
Coal (with shale partings)	30 in.
Black slate (with coal)	12 in.+
Coal	7 in.

The bottom coal is a slickenseit, and so is the black slate, an occurrence not known to the writer elsewhere in the region.

Big Laurel Creek.—On the left, five miles above Lewis creek. (Little Laurel is on the left one and one-half miles farther up).

On the right of the road and stream, two and one half miles up, 60 feet above it and 120 feet above its mouth is 32 in. coal with 3 in. hard shale parting, the upper seam in part a fine, hard, splint coal. This is about on the level of the Shepard coal on Oldhouse branch of Leatherwood and is either of the same, or of a bed near it. Thick coal is reported found in the creek, a mile or more above at about this level.

Fig. 252

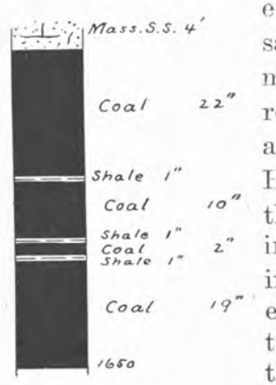


The section given in figure 252 is of coals found one half mile above Big Laurel, supposed to represent a part of the Fire-clay coal rider. Its base is at creek level.

On the left, six miles above Lewis creek, one half mile from Pine Mountain, 50 feet above Greasy, an entry gives the bedsection of figure 253. The same bed measured in 1886, near the mouth of Isaac branch and 25 feet above it, gave 55 in. coal with 8 in. in two partings, elevation 1650. An opening into the same bed, on the right, just above the mouth of Isaac branch, now fallen in, is reported to have thick coal. The bed appears to be in the neighborhood of the Hazard coal, and is most likely that one, though the coal is softer than is usual in it. It is a good, clean, bright, coking (?) coal, the lowest seam of the earliest opening a slickenseit. The entry now supplies the town of Incline, on the head of Laurel fork, and the locomotive running to it over tramroad for timber.

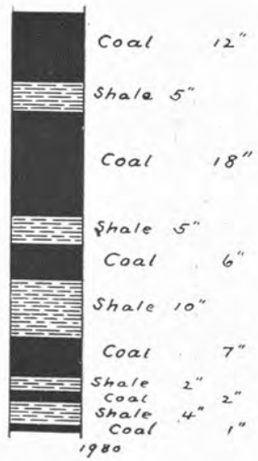
½ M. ABOVE BIG LAUREL

Fig. 253



Isaac Branch.—On the left at base of Pine Mountain, six and one half miles above Lewis creek.

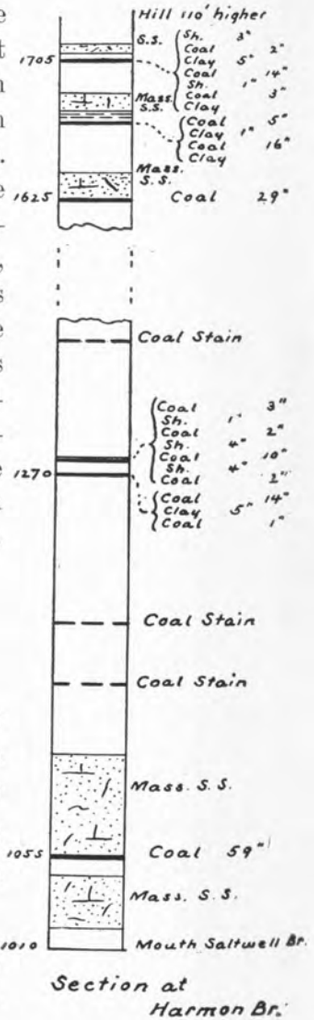
Fig. 254



At Forks

On the left, a half mile up the branch, 170 feet above it, elevation 1790, William Creech has 20 in. coal with three shale partings aggregating 6 in., and above this is the coal of figure 254, which appears to be of the Hindman bed. It is believed that the partings of the latter will diminish materially when the opening is carried to solid cover.

Fig. 255

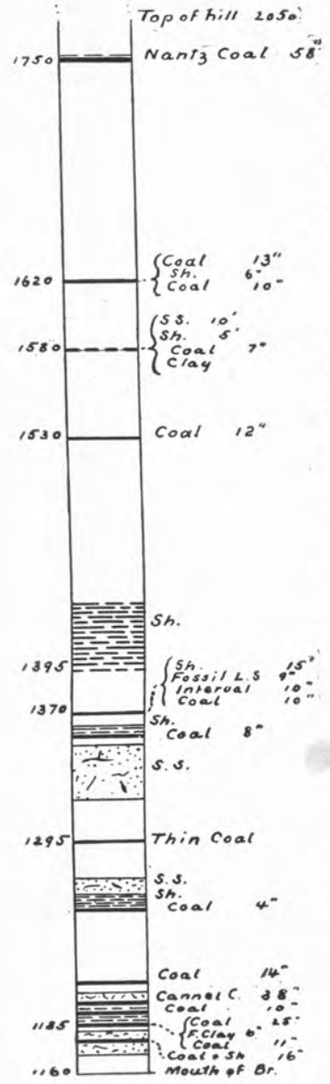


Section at Harmon Br.

Harmon Branch.—The three lower coals of the section, figure 255 were found on the right of the mouth of Saltwell branch, the others on the left of Harmon branch, one-half mile or more above its mouth.

The section shows the Whitesburg bed with its black slate roof, detailed in figure 256, at elevation 1055, as a good workable coal, which, being at the base of the hill, is well worth thorough investigation. It has a like section above Beech fork.

Fig. 257



Section at Oldhouse Br.

Fig. 256

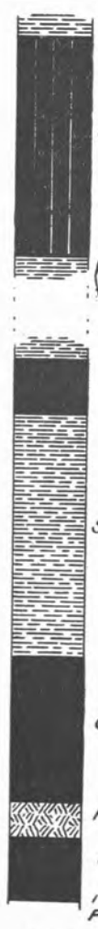
Hughes Morgan Whitesburg Coal

It is probable that the Hindman coal is above the upper coal of the section, but the three beds shown near the top of the section are of interest, because little is known of what coals lie near that bed in this region. One of them was opened again on Feckley branch, Cutshin creek, and one or two higher beds on Reuben branch, toward the head of Middle fork, but their correlation cannot yet be determined.

BEECH FORK.

Oldhouse Branch.—On the right, five miles up the fork.

Fig. 258



Considerable detail work, following my original exploration, was made on this branch for the Survey in 1891, by H. M. McConathy, but without finding any new coals of importance. The original section, given in figure 257, probably includes all coals up to the Nantz coal near the top of the section.

The Fire-clay coal is nearly down to stream level, and the 38 in. cannel is, in whole or in part, of the rider above it. Both beds are shown on enlarged scale in figure 258.

My sample of the 38 in. outcrop of the cannel rider was analyzed by Dr. R. Peter with the following results:

FIRE-CLAY COAL RIDER.	Chem. Report No. 2739.
Moisture	1.10
Volatile combustible matter	44.20
Fixed carbon	43.70
Ash (light gray-brown)	11.00
	100.00
Sulphur	0.690
Coke (dense)	54.70

At 185 feet above the Fire-clay coal Mr. McConathy discovered a dark fossil limestone 6 in. to 12 in. thick, apparently not continuous there, yet marking the horizon of what seems to be a widespread bed, or the approximate location of two or more beds, often, if not always, fossiliferous.

The Silas Nantz coal, figure 259, was opened one and three quarters miles up the branch, 590 feet above its mouth (one quarter mile and 140 feet above the Nantz house).

Fig. 259

At 565 feet above the Fire-clay coal, it is assuredly of the Hindman bed, for, though there is room for a slight correction for dip, the openings of the two beds are not far off the line of strike, and there is no other known bed in this region of such thickness near this level.

Analysis by Dr. R. Peter of my sample of the 46 in. splint coal follows. The ash content is surprisingly large, as the coal is fine-looking. Probably an underground sample would give much better results.

HINDMAN BED.	Chem. Report No. 2743
Moisture	1.30
Volatile combustible matter	32.36
Fixed carbon	50.34
Ash (lilac gray)	16.00
	100.00
Sulphur	1.409
Coke (dense spongy)	66.34
Specific gravity	1.502

"Seems to be somwhat weathered. Ferruginous incrustation on some pieces. Some fibrous coal apparent, but no pyrites."

On a left branch above the Silas Nantz house Mr. McConathy found the bed with but one bench of coal 44 in. thick, with a knife edge parting a foot from the top.

More recent openings of the Fire-clay coal and rider, on the left, " just above the mouth of Oldhouse branch, near the level of the wagon road" are reliably reported:

Cannel coal	40 in.
Shale	8 ft.
Coal and four partings	46 in.

Trace Branch.—On the right, one and one half miles up Beech fork.

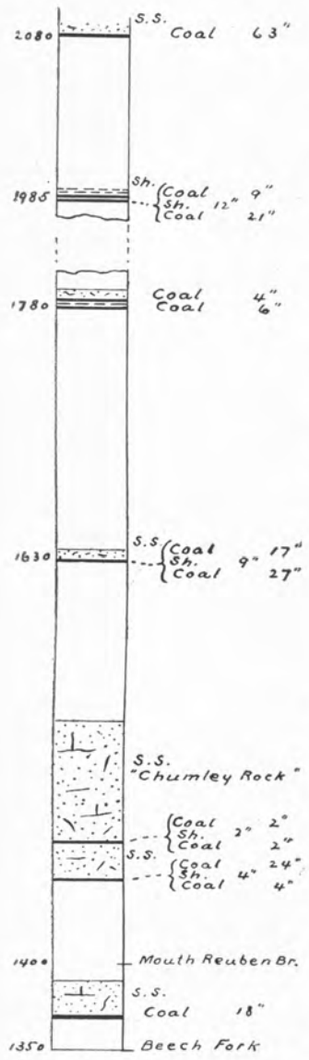
On the right, one quarter mile up (?), the cannel coal is 15 in. thick, with 12 in. bituminous coal directly under it; elevation 1210.

At six and one half miles up Beech fork the rider is reduced to the section following, and is but 15 feet above the fork:

		Elevation.
Sandstone	25 ft.	----
Black slate	5 in.	----
Cannel coal	6 in.	----
Bituminous coal	14 in.	1205

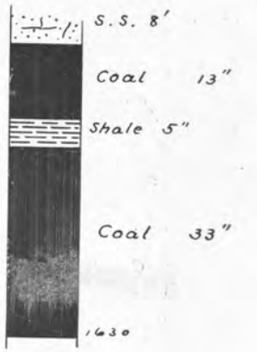
Figuring on a rise of strata of 20 feet per mile up stream from Oldhouse branch would bring the Fire-clay coal about 100 feet below drainage at Reuben branch, 11 miles up from the mouth of Beech fork, and this is probably pretty nearly correct. For this vicinity it will be assumed quite so.

Fig. 261



Reuben Br. Section

Fig. 260



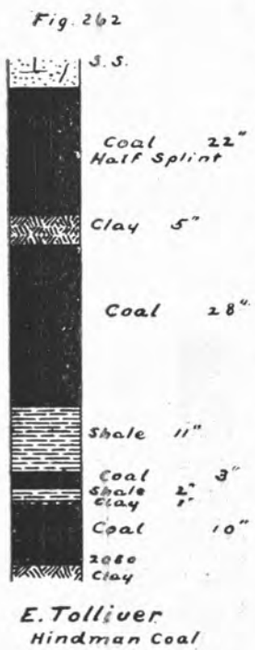
Heirs of Jas. Duff
Hazard Coal

The Fire-clay coal being assumed at elevation 1300, the coal of figure 260, on the left one quarter mile below Reuben branch, finds place as of the Hazard bed. Its section was measured here at the face of an eight-yard room, five yards underground. At the main face, seven yards in, the parting is 18 in. thick; one quarter mile down the river at G. W. Hoskins' it is nine in. thick, with coal as shown in figure 261, elevation 1630.

Reuben Branch.—On the right, 11 miles up Beech fork.

The coals found on this branch are shown in the section, figure 261, together with coals at elevations 1370, 1630 and 1780, found a half mile below the branch, and the coal of Chumley rock, one half mile above the branch.

The coal at 1630 being recognized as the Hazard coal, that at 2080 is most probably of the Hindman bed, with inter-



val of 450 feet between them, an increase from about 300 feet near Hyden.

Without much additional investigation it is impossible to determine where in the strata this thickening takes place, but it is believed to be almost wholly below the coal at 1985, which then is the Flag coal. This coal was opened on the left, three quarters mile up the right fork, one and one quarter miles from Beech fork.

On the right, one mile up the right fork, at Elijah Tolliver's, is the (former) Dale Bledsoe coal, at elevation 2080, shown in detail in figure 262. Ample covering to provide good working area lies over it. My muddy outcrop sample of this coal, analyzed by Dr. R. Peter with results below, contained much extraneous matter to increase the percentage of ash.

HINDMAN BED.	Chem. Report No. 2667.
Moisture	1.60
Volatile combustible matter	33.30
Fixed carbon	49.70
Ash (lilac gray)	15.40
	100.00
Sulphur	1.491
Coke (spongy)	65.10

"A somewhat weathered sample. Has no apparent pyrites."

A mile up the left fork, at G. W. Cooper's, are two openings which would correspond with those on the right fork except that the former are 230 feet higher, by barometer, than the latter.

Possibly the lower Cooper is the same as the Tolliver coal of the right fork, but more likely they are both of higher beds.

An entry into the lower one gives 3 feet of coal with 2 feet more reported under a thick parting; elevation 2220.

An unfinished cut in the upper one gave about 2½ feet of coal on 1½ feet of shale, with 2 feet of coal below; elevation 2310.

The top of the ridge is about 150 feet higher.

At the mouth of Chumley branch, 11½ miles up Beech fork, is "Chumley rock" a cliff rising from the water nearly 100 feet. At 35 feet up on this cliff, elevation 1485, say 170 feet above the Fire-clay coal, is 2 feet of limestone, apparently, which, opposite the mouth of Oldhouse branch, 12¼ miles up, shows at the edge of the stream bed one and one half feet fossil lime shale; elevation 1520.

On the Oldhouse branch, five miles up Beech fork, fossil limestone is found 185 feet above the Fire-clay coal, as before noted.

At 12½ miles up, at "Kate Spring," and 12¾ miles up are entries giving the bed-sections shown in figure 263, (see next page) (the lower 8 in. of each measured in water). With the Fire-clay coal at a calculated elevation of 1380 these openings, about 750 feet above it, appear to be of the Hindman bed. This view is supported by the gradual increase of interval

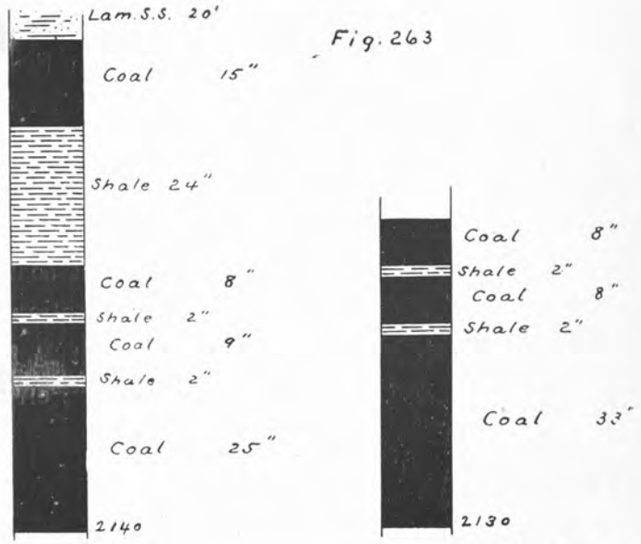
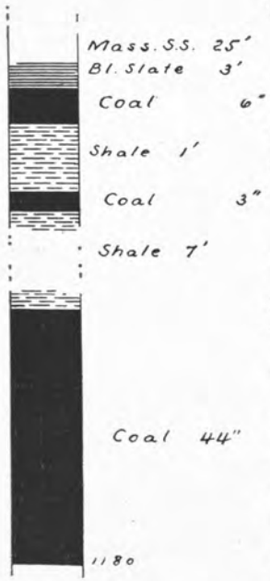


Fig. 263

Robt. Ellis

Samuel Creech

Fig. 264



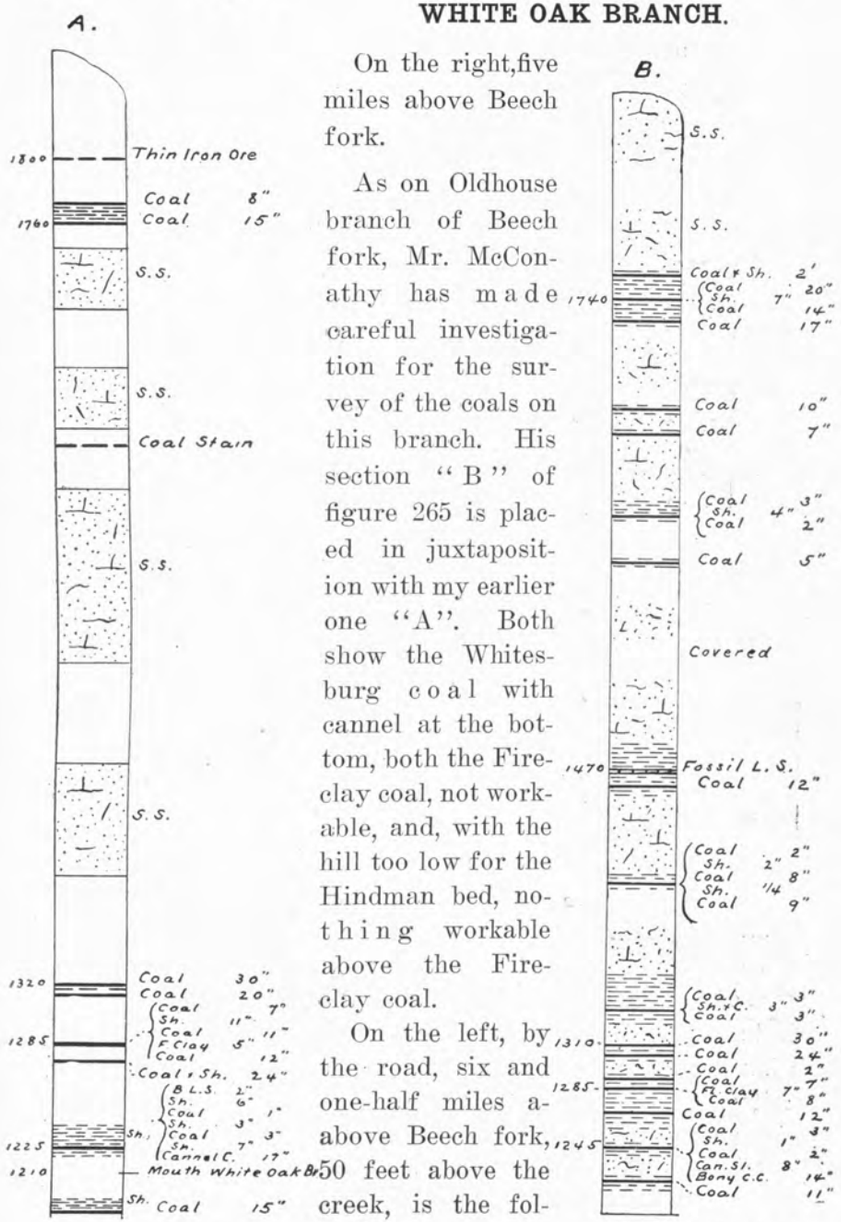
Chas. Hoskins
Whitesburg Coal

between the two beds evidenced at points above Hyden noted herein.

There is a large area of this coal in Kentucky ridge, and the high ridges on each side of Beech fork should contain much of it.

In a cliff on the right, one and one half miles above the mouth of Beech fork, 40 feet above Middle Fork, the Whitesburg bed has been opened as in figure 264. The main seam of coal is probably not given its full thickness, as the lower foot was measured in water and mud, and the floor was not reached. Both coal seams have black slate roof. The resemblance to the coal of figure 256 is close, and argues for a good working area of this coal.

Fig. 265



WHITE OAK BRANCH.

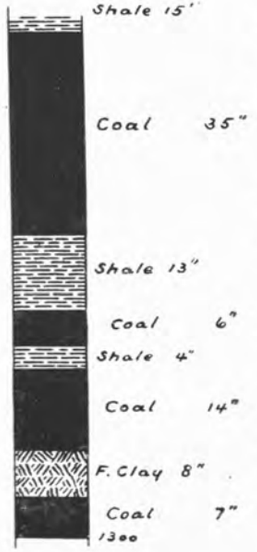
On the right, five miles above Beech fork.

As on Oldhouse branch of Beech fork, Mr. McConathy has made careful investigation for the survey of the coals on this branch. His section "B" of figure 265 is placed in juxtaposition with my earlier one "A". Both show the Whitesburg coal with cannel at the bottom, both the Fireclay coal, not workable, and, with the hill too low for the Hindman bed, nothing workable above the Fireclay coal.

On the left, by the road, six and one-half miles above Beech fork, 1250 feet above the creek, is the following:

		Elevation.
Sandstone.		
Shale	2 ft.	----
Coal	4 in.	----
Parting	1 in.	----
Coal	12 in.	----
Parting	5 in.	----
Coal	11 in.	1300

Fig. 266



Near mouth of Marrowbone
Fire Clay Coal.

This is evidently of the Fire-clay coal bed, but the lower parting, not a true flint-clay, is a "jack rock," similar to that found occasionally in the bed on North Fork waters, and near the head of Red Bird creek.

At seven miles up, near the mouth of Marrowbone branch, the Fire-clay coal has the section of figure 266.

On the point of a hill in a barren field on the left eight and one half miles above Beech fork, 25 feet above the stream, the Fire-clay coal outcrop is exposed in shale with the characteristic flint clay, very prominent, about 3 in. thick. Elevation 1380.

ROARK BRANCH.

On the left, nine miles above Beech fork.

At R. J. Lewis' store at the mouth of this branch, the upper seam of the Fire-clay coal at elevation 1420, has been dug from the branch, ten feet above the river, 26 in. thick, and coal below a hard parting was reported, but was deep in water when visited. A thin coal with two partings lies 20 feet higher, with shale between.

On the left, nine and one half miles up, five feet above the river, is 35 in. coal under 20 feet shale with 5 feet laminated sandstone above the latter. This seems to be the last appearance of the top of the Fire-clay coal on this fork—at elevation 1380.

On the left, nine and three quarter miles up, 25 feet above the river, at elevation 1425, the rider shows 35 in. fine, hard coal, partly slickenseit, with five feet of shale over it. It probably goes below drainage at the mouth of Spruce Pine.

SPRUCE PINE BRANCH.

On the left, ten miles above Beech fork.

Fig. 267

Spruce Pine Br.
Hindman Coal

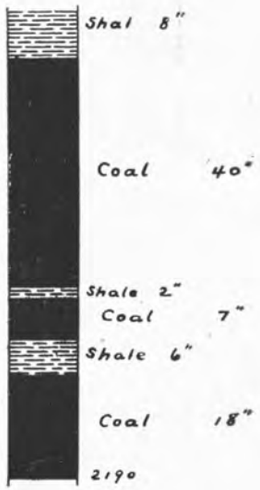
On the right of the first right branch of Spruce Pine, an opening 695 feet above its mouth is stated, in a report to the Tennis Coal Co. by Neil Robinson, to have the section shown in figure 267.

The Fire-clay coal being probably about 30 feet under the mouth of Spruce Pine makes this, the Hindman bed, about 725 feet above it.

On the left, 11 miles above Beech fork near the head of the branch at R. L. Helton's, his coal has the section of figure 268. It is again the Hindman coal, showing finely as exposed in a wide outcrop opening. The coal looks favorable for coking, though in part splint. A streak of pyrites six in. from the bottom on one side of the opening, gives the only visible sign of sulphur.

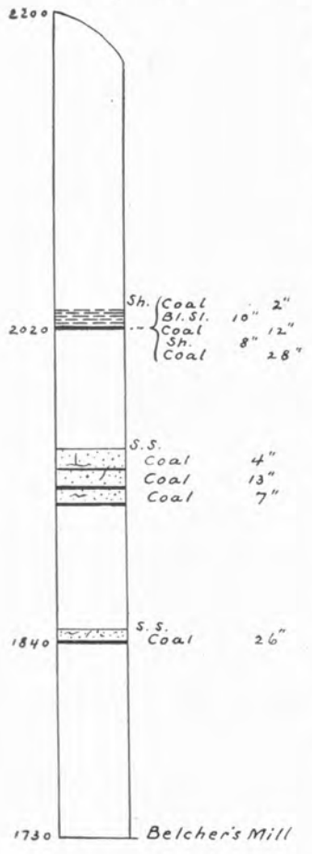
Though this coal is cut out, or nearly so, by gaps at the heads of Peter branch and Salt Trace, Straight creek, the main Kentucky ridge, being several hundred feet higher, gives scope for large mining operations in this bed.

Fig. 268



R. L. Helton
Hindman Coal

Fig. 269

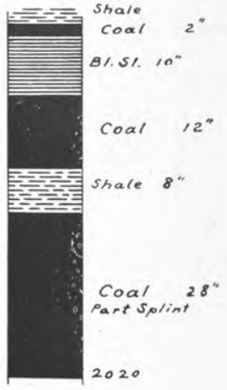


Section at Wm. Helton's

The section of figure 269, with base at the junction of the road to Philips fork of Red Bird with that down Middle fork, shows the coals found on Rainbow (or Meadow) branch, along the road toward Philips fork.

The upper coal, at William Helton's, shown also in figure 270, may be of the Hazard bed, the Hindman bed being here probably near the top of the hill. The same bed is opened again, in better condition, at the head of the main stream, as shown above.

Fig. 270

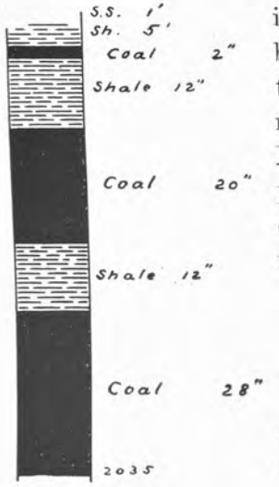


Wm. Helton

On the right of the splash-dam at the forks of the main stream, one and three quarter miles from the splash-dam at the above road forks, coal 26 in. thick, at elevation 1845, is exposed in a rockhouse, evidently the same as the 26 in. coal of figure 269.

Nearly one half mile up the left fork from this coal, on the right, 100 yards beyond the upper house on the Middle

Fig. 271



A. J. Asher

Fork, is the coal of figure 271. This, in connection with the opening of figure 270 indicates a good workable coal of possible large area lying 150 to 200 feet below the Hindman coal, likely to prove of much value in this vicinity, especially in Kentucky ridge. A still higher bed may prove workable. Notes of some coals on the south side of the ridge therefore follow, which should aid development.

CUMBERLAND RIVER.

Straight Creek.

Peter Branch.—On the left, one mile above Salt Trace (on which is the road from Middle Fork).

At Millard Whitehead's, two miles up, one quarter mile up a right branch, Hindman(?) coal, 43 in. without parting; elevation 2150.

Salt Trace.—On the right, by the road, what is probably the Fire-clay coal or its rider, coal reported 28 in. under ten feet of shale containing siderite; elevation 1485.

On the left at Salt Trace P. O. three quarter mile up.

		Elevation.
Shale and sandstone	15 ft.	
Black slate or slaty coal	8 in.+	----
Shale	8 in.+	----
Coal	32 in.+	1795

Laurel Branch.—On the north, one and one half miles below Salt Trace.

Opening near head of branch, one and one quarter miles west of Salt Trace P. O.

		Elevation.
Shale, clay and earth	10 ft.	----
Coal	1 ft.	----
Clay with coal	2½ ft.	----
Coal, reported	4 ft.	2265

Of the 4 feet of coal reported only 8 in. of the top was visible, but the excavation indicated a bed of that thickness. Some extra fine, splint coal lay on the dump. The bed is about 100 feet above the Hindman (?) coal, and seems likely to be of the upper Cooper coal of Reuben branch, page 228.

KENTUCKY RIVER.—SOUTH FORK.

No investigation by the writer has been made of the coals on this fork in Lee and Owsley counties, hence this area must be passed over with but the statement that the Beattyville coal, going under drainage probably close above the mouth of the South Fork, lies but little below the stream level up to the Clay county line, or even to Manchester.

Its favorable condition in the vicinity of Beattyville and on Sturgeon creek should induce boring for it on South Fork waters.

SEXTON CREEK.

Not having examined recently the coals on this creek the following are introduced as matter of record only, taken from my report of 1886.

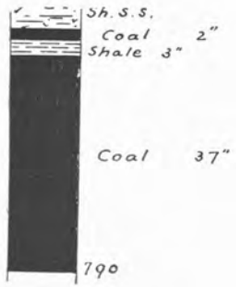
On Hogskin branch of a left fork of Sexton a coal 21 in. thick is referred to Coal No. 2 and at Mrs. Reid's at the head of Sexton, coal 31 in. thick, with black slate roof, is probably of the same bed, 100 to 125 feet above Coal 1, which here will be called the Manchester bed.

At the old Salt works, Ammie postoffice, one quarter mile below Bullskin, the Manchester bed is about 3 feet thick, without parting, as mined on both sides of the river and but little above its level.

BULLSKIN CREEK.

At the mouth of Little Bullskin, close to its level, the Manchester bed is 24 in. thick without parting; elevation 740.

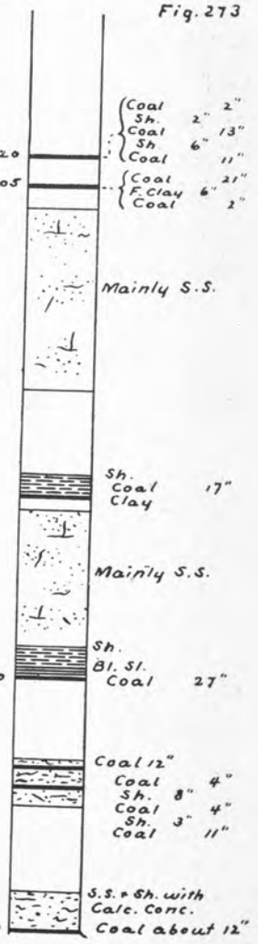
Fig. 272



At Mr. Davidson's, three and one half miles up, it has 39 in. coal as in figure 272, the strata having risen so that the bed is here 30 feet above the creek.

At Samuel Davidson's, four and one half miles up, the section of figure 273 was taken, in which the Manchester coal is at or below drainage level, and the Fire-clay coal, at elevation 1205, makes its first known appearance on this fork, thin here, but showing well at a number of places on Red Bird tributaries. The rider to the Fire-clay coal is also apparent.

Fig. 273

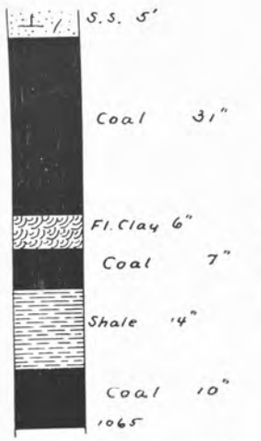


Big Branch.—On the right, six miles up Bullskin creek.

Mr. S. Davidson has a six-yard entry on a left branch, a mile up and 265 feet above the mouth of the branch, into the Fire-clay coal, which gives the following section:

		Elevation.
Sandstone	5 ft.	----
Shale	6 in.	----
Coal	27 in.	----
Flint fire-clay	5 in.	----
Coal	6 in.	1075

Fig. 274



Showing, if elevations are correct, a considerable dip from four and one half miles up the creek almost due east.

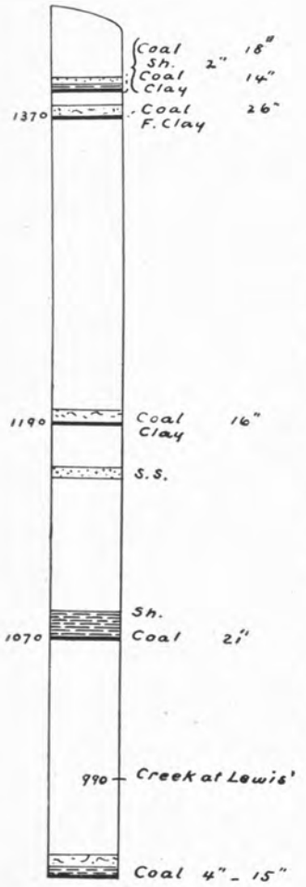
At seven and one half miles up, 15 feet above the creek, is 25 in. coal under eight feet of shale, elevation 860, which is probably the equivalent of the 27 in. coal at elevation 930 in the section of figure 273.

Trace Branch.—On the right, eight and one quarter miles up Bullskin.

On the right, one-half mile up the branch, 205 feet above its mouth, James Warnock's four-yard entry gives the bed-section of figure 274, nearly level with the Fire-clay coal on Big branch.

By the road, some 12 miles up Bullskin and a mile from the head of Hell-for-Certain creek, the top seam of the Fire-clay coal is opened 26 in. thick under sandstone roof. The flint clay shows on the floor and coal is probably under it: elevation, with some question, is 1075.

Fig. 275



Section at A. Lewis'

RED BIRD CREEK.

Hector Creek.—The section taken at Addison Lewis', five miles up the creek, shown in figure 275, gives the two beds under the Fire-clay coal varying in thickness and relative position remarkably little from what was found on Bullskin, figure 273.

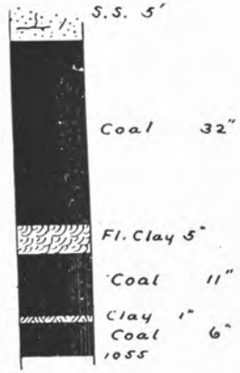
The Fire-clay coal at 1370 is 165 feet higher than on Bullskin, and has either lost its lower member, or it was not found, while the usual parting is here an impure fire-clay. The rider, too, resembles closely that of figure 273.

Jack's Creek.—On the left, one mile above Hector (there is another Jack's creek above Bowen creek).

Bowling Branch.—On the left, two miles up Jack's creek.

On the left, one eighth mile up the branch, 160 feet above Red Bird, Bowling's six-yard entry gives the Fire-clay

Fig. 276



David Bowling
Fire Clay Coal

coal as shown in figure 276. Directly across the ridge to the north on Big branch of Bullskin, the same bed gives 33 in. coal, as noted.

The bed is reported opened again farther up the creek.

Big Creek.—In 1891, Mr. G. M. Sullivan made for the State Survey a detailed examination of parts of this and other Red Bird tributaries above it, and, in addition to my own notes, his report is largely incorporated, and his page maps inserted. The location of his openings can be seen on the maps, and their elevations can be estimated generally by reference to the base of his sections, to which I have given elevations as obtained from the United States map. His page maps, though based on that map, earlier and less accurate than his, have their details sketched in with a fair approach to accuracy.

On the following page is his map of Big creek and branches and his section taken on School-house branch of Ulysses fork.

Fig. 277

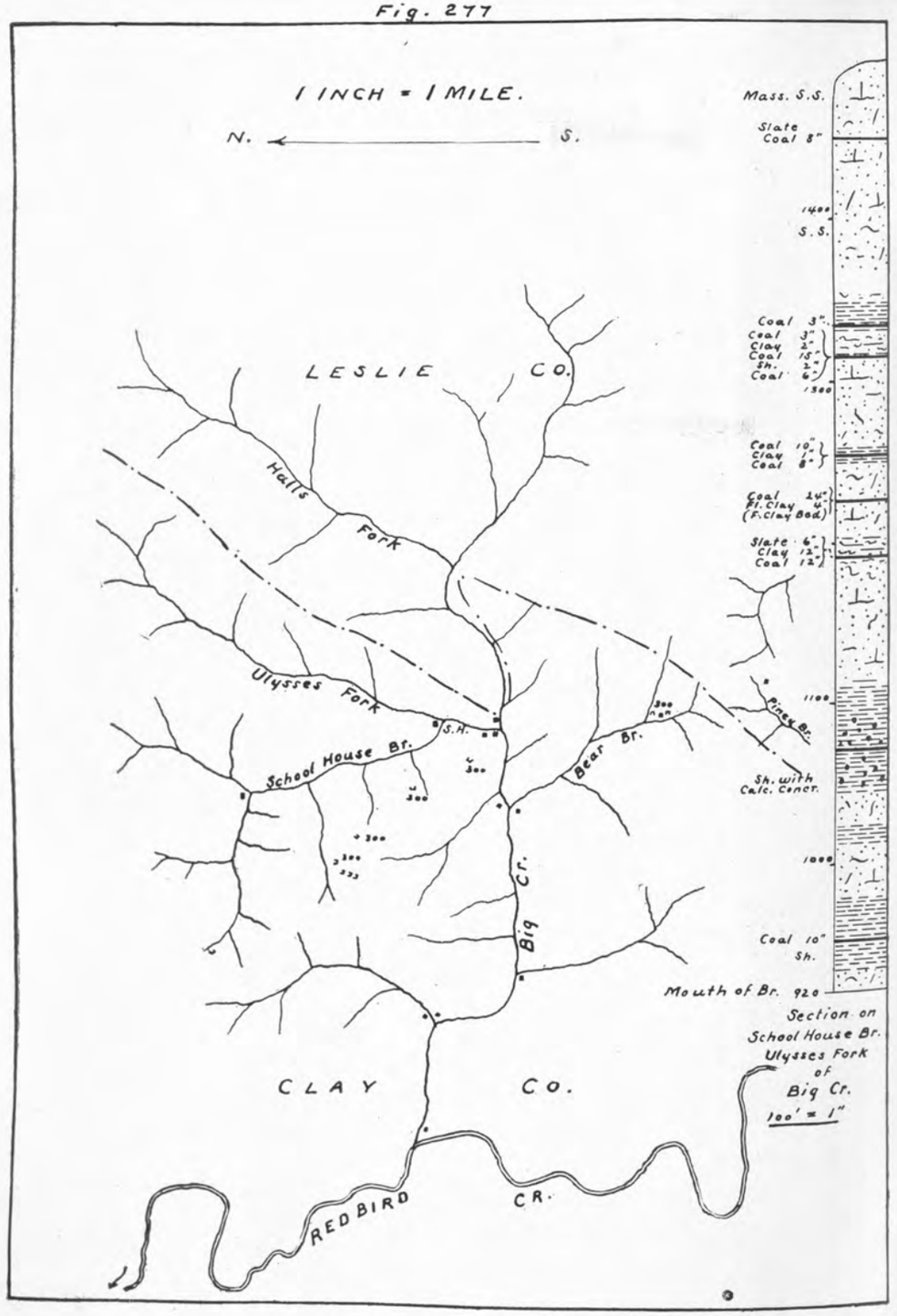
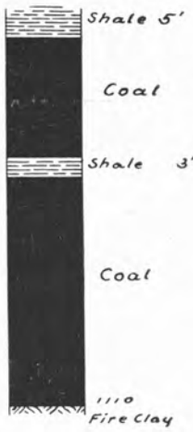


Fig. 278



Bear Branch.—A mile up this branch, openings by Mr. Clarkson, probably unfinished, developed, according to Mr. Sullivan:

Coal	6 in.
Clay	5 in.
Coal	20 in.

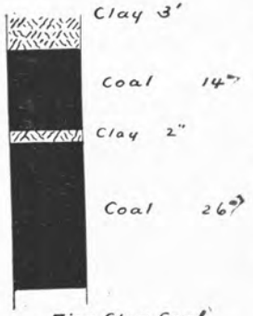
And coal 33 in., the latter 5 feet below the former.

In apparently the same place (on the right of a left branch), my recent visit found a six-yard entry with coal as in figure 278. The floor of the entry is a common hard underclay with thick sandstone below it. The entry is in the Fire-clay coal bed.

Between the upper forks of the branch, one and one quarter miles from its mouth, at water level of the left fork, the bed shows:

Coal	16 in.
Shale	5 in.
Coal	24 in.

Fig. 279



the lower 6 in. in water and bottom nearly but not quite found.

Mr. Roberts has opened, on the north of Big creek and just below Ulysses fork, the same bed with the result shown in figure 279. An upper bench of coal (the rider (?) was hidden by timbering. No flint clay in this or the two next preceding openings was found, but there is no question as to identity of the bed.

Ulysses Fork—School-House Branch.—Mr. Sullivan's vertical section, with his page-map, gives probably all the coals in outcrop on this section, with none but the Fire-clay coal of workable thickness. Of four openings made, but one, nearest the mouth of the fork, is in thick coal, and it probably includes the rider, as shown in figure 280.

Fig. 280

Mr. Sullivan's sample from the badly weathered outcrop of the 38 in. seam gave, to Dr. R. Peter's analysis:

FIRE-CLAY COAL.	Chem. Report No. 3129.
Moisture	5.80
Volatile combustible matter	27 84
Fixed carbon	55.16
Ash (light gray)	11.20
	100.00
Sulphur	.526
Coke (pulverulent)	66.36

Fig. 281

The next two openings up the fork are as follows, the latter dipping at a sharp angle, N. 20 degrees W.

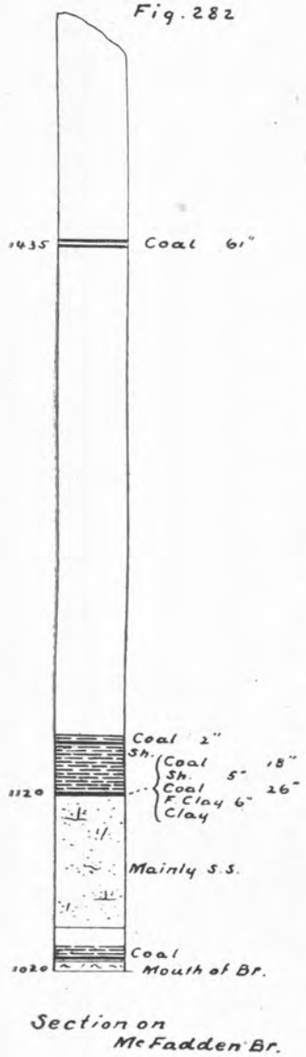
1.		2.	
Coal	3 in.		
Clay	1 in.		
Coal	24 in.	Coal	24 in.
Flint-Clay	4 in.	Flint-Clay	4 in.

The fourth opening is also in thin coal.

Near the head of the branch, on the road to Jack's and Bullskin creeks, J. M. Finley has a 50-yard entry of more recent date, showing at its mouth as in figure 281. The floor is a bituminous shale,

and the lower 8 in. exposed is a bony coal not now mined. At the face about 4 feet of coal is taken. It is evidently of the Fire-clay coal bed.

Fig. 282

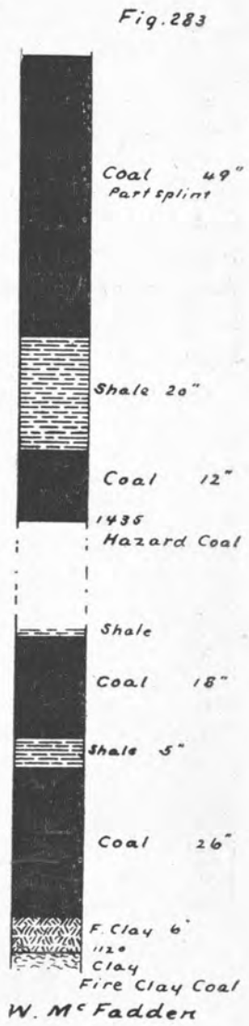


McFadden Branch.—On the right of the road to Rockhouse creek and Hyden, one mile above Hall's (or Hal's) fork.

Of the two principal coals shown in the section figure 282 the lower is of the Fire-clay coal bed, and the upper, unless the interval has changed largely from that on the Middle Fork below Hyden, is of the Hazard bed. These are represented on enlarged scale in figure 283.

My sample of the upper coal gave the following analysis, by Dr. R. Peter:

Fig. 283

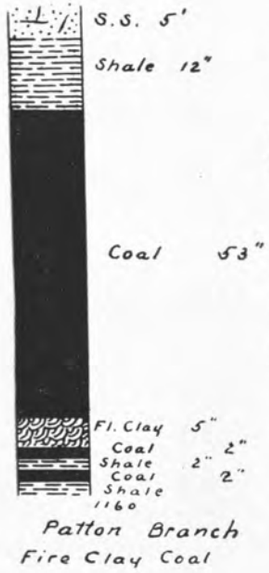


HAZARD BED.	Chem. Report No. 2740.
Moisture	1.60
Volatile combustible matter	34.94
Fixed carbon	55.46
Ash (lilac gray)	8.00
	100.00
Sulphur	1.066
Coke (spongy)	63.46
Specific gravity	1.322

"No pyrites apparent, and but little fibrous coal."

On the right, opposite the mouth of Patton branch, 60 feet above it, elevation 1075, the Fire-clay coal shows good thickness in an opening too much covered for measurement. A streak of pyrites, 2 in. thick, 18 in. from the top, appears to have replaced the 5 in. shale parting in the McFadden branch opening.

Fig. 284



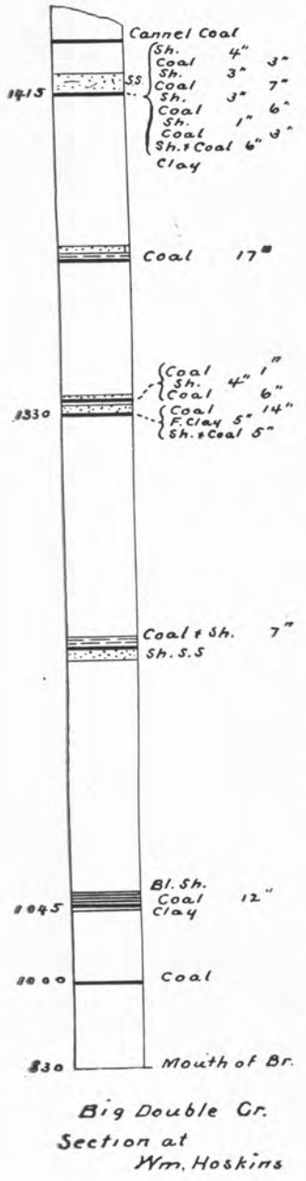
Patton Branch.—On the left, two miles above Hall's fork.

A half mile up, at stream level, is an opening into the Fire-clay coal bed showing as in figure 284.

On the left of Big creek, five feet above it, two and one quarter miles above Hall's fork the former Pleasant Sisemore opening, now Richard Collins bank, shows the Fire-clay coal, also as in figure 284, except that the flint-clay parting is 2 in. thicker. The main seam is in part splint coal.

My sample of this coal, formerly

Fig. 285



given as on Hal's fork, and Prof. Crandall's sample of the same, reported from Howell's fork, analyzed by Dr. R. Peter, gave results, respectively, as reported under Nos. 2741 and 3187.

FIRE-CLAY COAL BED.	Chem. No. 2741	Report No. 3187
Moisture	1.40	2.98
Volatile combustible matter	35.68	33.98
Fixed carbon	58.92	59.98
Ash (light reddish gray), (brownish gray)	4.00	3.06
	100.00	100.00
Sulphur	0.667	.404
Coke (spongy)	62.92	63.04
Specific gravity	1.285	-----

No. 2741. "No apparent pyrites, and but little fibrous coal."

The ash is remarkably low, and especially for this bed.

The rider shows in the cliff above this opening, 22 in. thick, with 10 feet of sandstone and shale between and with a roof of sandstone, eight feet exposed.

Big Double Creek.—Figure 285 represents a section taken on this creek, two miles up from its mouth. The Fire-clay coal and its rider are of chief interest here though of no value. Coals below it cannot now be correlated, nor can coals above it, though they are suggestive of the Haddix, Hazard and Flag coals,

as found on the North Fork, and the cannel of the upper bed, common in the Flag coal, strengthens the suggestion.

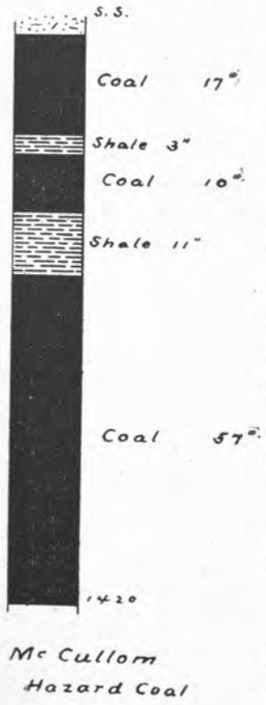
Sugar Creek, Spruce Pine or Piney Branch.—On the left, one mile up Sugar creek.

Mr. Sullivan gives the measure of an opening into the Fire-clay coal on the right, one eighth mile up, (now fallen in) as:

Coal	3 in.
Shale	3 in.
Coal	26 in.
Flint Clay	5 in.

Its elevation I make 1125.

Fig. 286



Laurel Branch.—On the left two miles up Sugar creek.

At the extreme head of this branch, across from the head of Spruce Pine branch, on the McCullom tract, an excellent entry has been driven into the Hazard bed, from which figure 286 is derived. Being only 60 feet under the hill-top no mining can be done here, but with the coal dipping eastward into the higher main ridge, a good field of it may be found in that direction. The upper McFadden coal of Big creek (figure 283) gives additional reason for expecting it, but it has not been found of workable thickness elsewhere on Red Bird waters.

Prof. A. R. Crandall's sample from the lower 55 in. of coal yielded, to Dr. R. Peter's analysis:

HAZARD BED.	Chem. Report No. 3188.
Moisture	1.80
Volatile combustible matter	34.00
Fixed carbon	57.06
Ash (light gray)	7.14
	100.00
Sulphur	0.742
Coke (spongy)	64.20

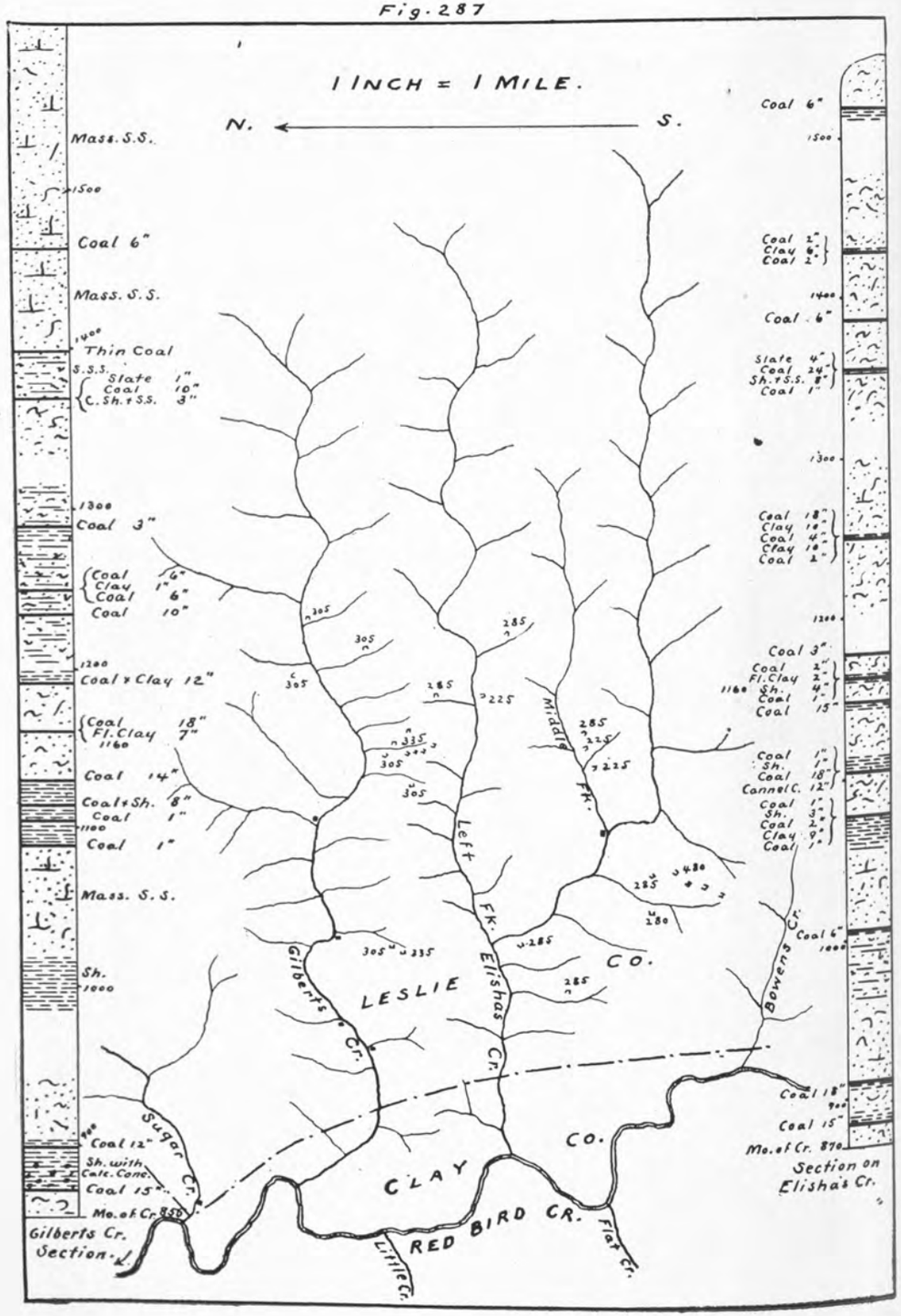
It looks like a good coking coal, as seen at the face of the entry.

Gilbert's Creek.—The following page-map by Mr. Sullivan, figure 287, gives the location of openings on this creek, and the vertical section on the left shows the paucity of its coals.

The complete section was taken about two miles up the creek, and but little over four miles southward from that of School-house branch, Ulysses fork. It includes fourteen coals, none of them two feet thick.

The Fire-clay coal, opened in five places, each having the flint-clay as parting or floor, gave a maximum thickness of coal of 22 in. The Hazard coal was found thin, but there is yet possibility of its being thick (as on Sugar creek) near the head of the creek, where its area must be fairly large.

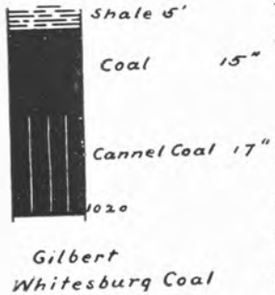
Fig. 287



Elisha's Creek.—The page-map and vertical section of figure 287 give thirteen coals on this creek as found by Mr. Sullivan. The principal coal is of the Whitesburg bed, known in the vicinity as the Gilbert cannel coal.

This bed more recently opened on the right, a mile up the creek, 130 feet above it, gave, in a six-yard entry, the coal of figure 288. The bituminous coal is bright and fine-looking, the cannel of light weight and excellent fracture and there is no plane of cleavage between them.

Fig. 288



Mr. Sullivan reports four openings into this bed, one a 50 foot entry one half mile up the main creek, two on the middle fork and one on the left fork, the first of them alone having cannel coal. The bed-sections of three of themmeasured:

MAIN CREEK.		MIDDLE FORK.		LEFT FORK.	
Shale		Shale		Coal	4 in.
Coal	1 in.	Coal	27 in.	Shale	2 in.
Slate	1 in.	Clay	1 in.	Coal	2 in.
Coal	17½ in.	Coal	½ in.	Clay	11 in.
Cannel coal	12 in.			Coal	4 in.
				Clay	25 in.
				Coal	11 in.

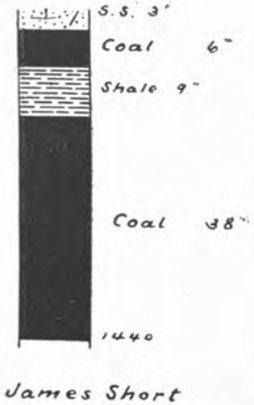
Mr. Sullivan's sample of the firm cannel coal, analyzed by Dr. R. Peter, gave:

WHITESBURG BED.	Chem. Report No. 3128.
Moisture	0.60
Volatile combustible matter	49.20
Fixed carbon	43.00
Ash (light brownish gray)	7.20
	100.00
Sulphur	.483
Coke (very dense)	50.20

The Fire-clay coal 60 feet above the next preceding, is noted at six different points, each with flint clay and coal over it varying from one in. to eight in.

The 24 in. coal under black slate, 200 feet above the Fire-clay coal 10 in. thick on Gilbert creek (of the Hazard bed (?) appears to be the next in importance.

Fig. 289



Flat Creek.—In the bed of Red Bird, near the mouth of this creek, what is probably the Manchester bed goes below drainage with about 2 feet of coal.

Right Fork, Panther Branch.—On the left, near the head of the fork, Flat creek.

Figure 289 represents the coal at an opening north of Mr. Short's house, below the road to Martin's creek. He reports 2 feet more of coal in the bottom of the bed, under a parting of 1½ feet, and also 3 feet of coal 40 feet lower.

Figure 290 represents coal opened 100 yards north of the Martin's creek gap and 25 feet above it. Mr. Short's reports would indicate that this coal, said to be shown complete, lies below that which he has opened, and its elevation and the general pitch of strata tend to confirm this view, but the sections of the two openings are so like that there is good reason to believe that they are of the same bed. With the 2 feet of reported coal added underneath the bed-section resembles that of Mr. Walker's cannel coal on Martin's creek, page 281.

Fig. 290

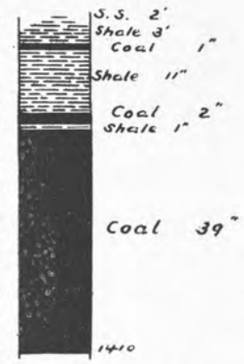
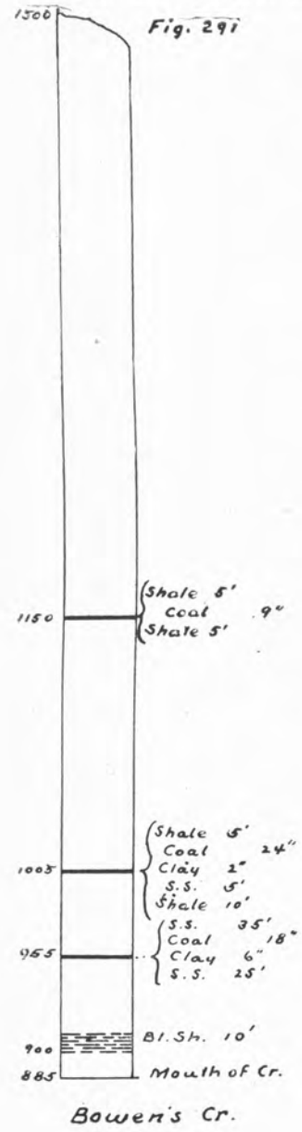


Fig. 291



These coals are too high in the hills to be of any very great value here, but southward their areas increase rapidly. Until additional data are obtained their correlation must remain in doubt, but they are not far from the Fire-clay coal bed. The opening at the gap appears most likely to be of that bed.

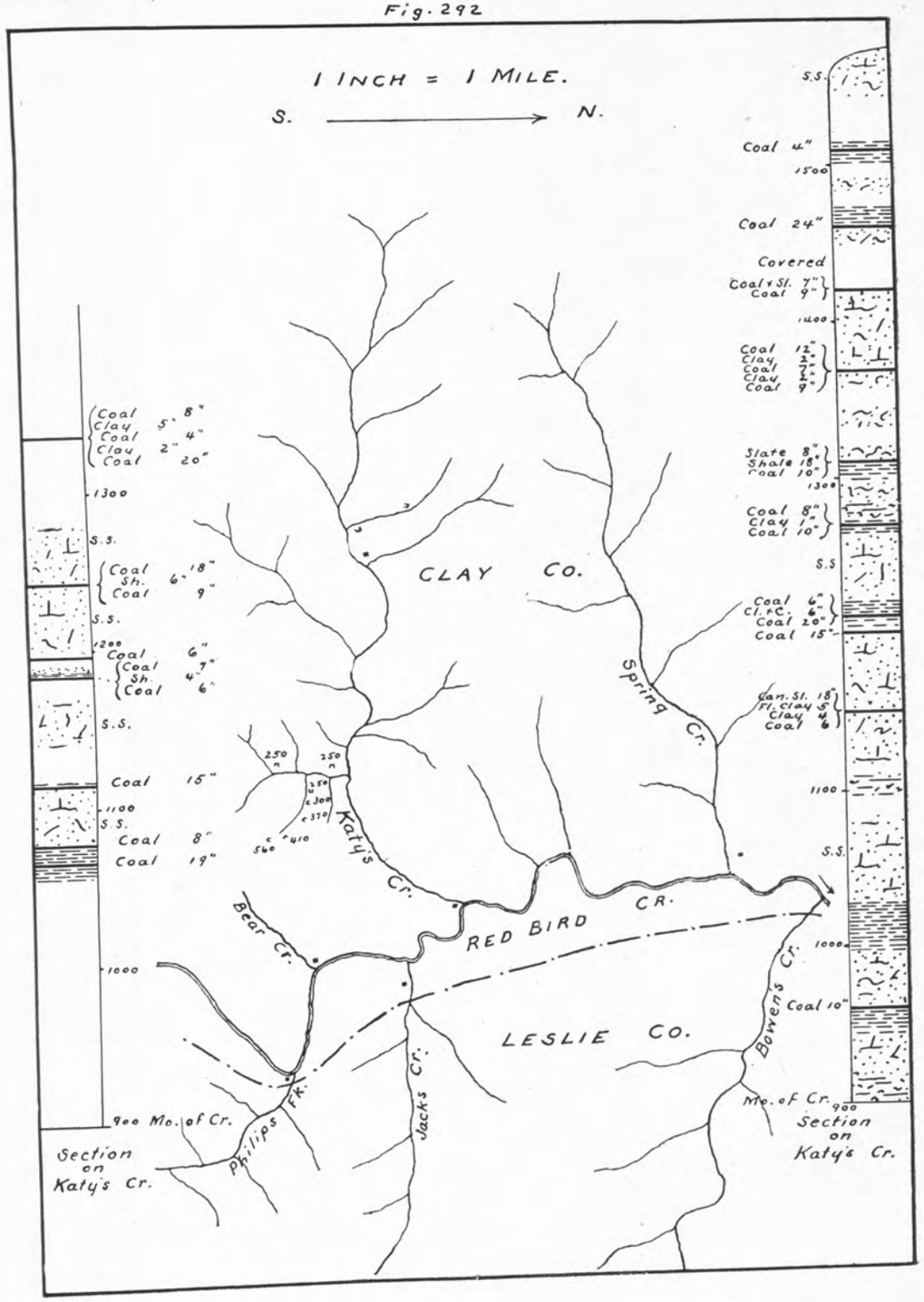
Bowen's Creek.—In addition to my early section of the lower coals on this creek, given in figure 291, a number of openings since made for the N. Y. &

Ky. Land & Lumber Co., were all reported thin. A very thick bed is currently reported, however, as opened in 1906.

Spring Creek.—This stream also has been prospected by the N. Y. & Ky. Land & Lumber Co. without finding any thick coal.

Katy's Creek.—On the following page is given in figure 292, Mr. Sullivan's map of this region, and, on the right of that map, his vertical section of strata found on the creek.

Fig. 292



Of the ten coals he found, the Fire-clay coal at elevation 1155 is of most interest, showing itself here in a new phase, with cannel slate in place of the coal on the flint-clay, and the lower coal separated from it by common clay.

My early section is given on the left of the map, all coals in it but the upper one having been found in a right branch about two miles up; the upper one three miles up.

Opposite the right branch, three miles up the creek and next above the Alvis Hubbard house, 80 feet higher than the latter, the coal of figure 293 was found. Allowing for a rapid rise, for such there is, from the location of Mr. Sullivan's section, this coal must be near the horizon of the Fire-clay coal bed. It is, perhaps, the upper seam, apart from its usual parting, or else the rider to that bed. My outcrop sample of this coal, too high in ash to represent the coal fairly, analysed by Dr. R. Peter, gave:

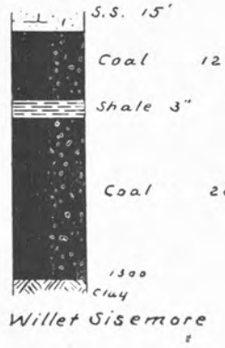
Fig. 293

Chem. Report No. 2654.	
Moisture	1.60
Volatile combustible matter	34.28
Fixed carbon	54.82
Ash (purplish brown)	9.30
	100.00
Sulphur	1.766
Coke (dense spongy)	64.12
Specific gravity	1.290

"A somewhat weathered sample."

Mr. Sullivan, in search of this opening, found, probably in the same bed, on the opposite side of the creek as shown on this map, but 24 in. coal, without parting. Local knowledge of the original opening had been lost.

Fig. 294



Bear Creek.—On the left of the creek, behind the Sisemore house two miles up, the coal of figure 294 is opened. The floor is not flint clay, but, as with the 40 in. coal on Katy's creek, this seems most likely to be the upper seam of the Fire-clay coal, or its rider. The coal dips quite rapidly southeast and an anticline is probably between this and Katy's creek.

Jack's Creek.—The general results of Mr. Sullivan's work on this creek are given in the section on the right of the page-map, figure 295.

Fig. 295

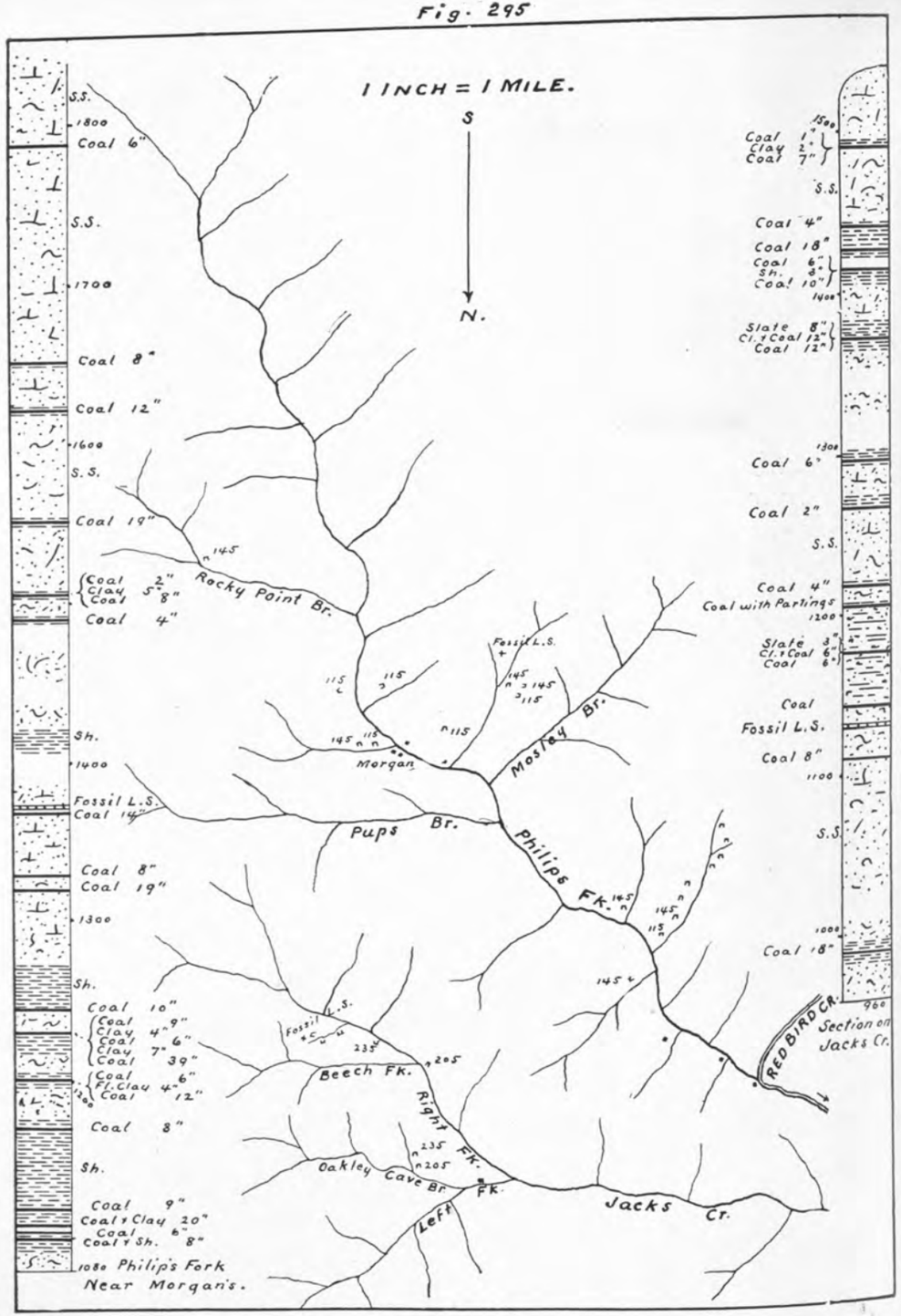


Fig. 296

Mouth of Creek.
Fire Clay Coal Rider

"A complete section was made near the mouth, and a partial one about three miles above, and near the forks of, the creek. Thirteen coals were developed in this region and all of them were thin excepting one."

The Fire-clay coal was found on Oakley Cave branch, near its level, and on Beech fork near its mouth, carrying flint-clay and but little coal.

Thirty feet higher the rider was opened at the mouth of the creek, badly split up, as in figure 296. Other openings, on the Left fork and on Oakley Cave branch, near their mouths have the sections stated below:

	LEFT FORK.	OAKLEY CAVE.
Coal	15½ in.	13½ in.
Clay	2½ in.	1 in.
Bit. shale	1½ in.	1½ in.
Coal	26 in.	24 in.

A fourth opening into this bed, on the left of a right branch, one-half mile up the Right fork, gave the section of figure 297. The two lower seams of coal are not now visible.

From all but the first of these four openings samples of firm coal were taken by Mr. Sullivan, and analyzed by Dr. R. Peter with the results following:

Fig. 297

Thomas Bird
Fire Clay Coal Rider

Chemical Report

FIRE-CLAY COAL RIDER.	No. 3183 Left Fork	No. 3184 Oakley Cave	No. 3186 Right Fork
Moisture	1.20	1.04	0.74
Volatile com. matter	27.88	33.36	33.86
Fixed carbon	64.92	59.68	57.48
Ash	6.00	5.92	7.92
	100.00	100.00	100.00
Sulphur	.721	.357	.532
Coke	70.92 dense	65.60 spongy	65.40 spongy
Color of ash	very light gray	gray	light gray

Higher coals appear not to have been investigated toward the head of the creek, where there is some reason to believe thick coal may be found, especially in the Hazard bed, 300 feet above the Fire-clay coal. Strata lie nearly level along the creek and through the ridge down White Oak branch to Middle Fork.

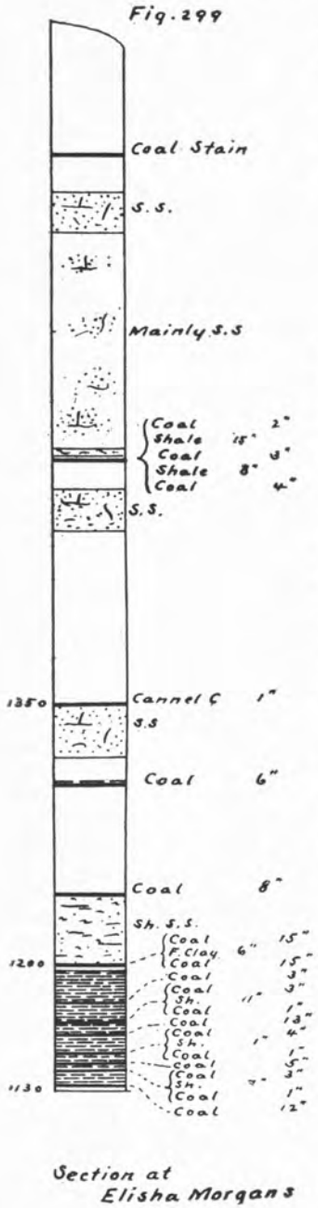
Fossil limestone is not known to occur elsewhere 50 feet under the Fire-clay coal, and its position in the section is doubtless erroneous. It is located on the map well up the creek, where the Fire-clay coal must be below drainage, and Mr. Sullivan reports, "a bituminous fossil limestone was noted about 170 feet above the flint clay coal." This corresponds closely with its estimated position near the head of Middle Fork. In the creek bank, on the left about two miles up, and about 70 feet below the Fire-clay coal, (possibly but 50, as in the section) is a bastard limestone, 1½ feet thick, unique in its cleavage into blocks, somewhat like cannel coal. I saw this from across the creek and did not look for fossils in it.

Fig. 298

A. J. Asher
Fire Clay Coal

Mr. Neil Robinson reported to the Tennis Coal Co. the coal of figure 298, at "Jack" Asher's, at the mouth of Phil-

Fig. 299



Section at
Elisha Morgans

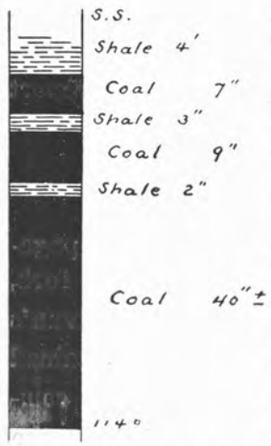
ip's fork and 115 feet above it; the 29 in. seam a block coal. This, the Fire-clay coal, has not shown such thickness elsewhere in the vicinity, but the report should not be discredited.

Philips Fork.—The preceding page-map, figure 295, includes Philip's fork, and on its left margin is Mr. Sullivan's section, with seventeen coals, obtained on that fork. My earlier and less complete section, figure 299, taken in the same vicinity, shows variation of coals, as well as some barometric inaccuracies, resulting in apparent differences of intervals between coals.

The splitting up of the Whitesburg bed, 60 feet below the Fire-clay coal, into several thin ones is made evident in my section.

Mr. Sullivan made four openings in-o the Fire-clay coal bed, all giving about 3 in. of coal above, and 13 in. below, he flint clay parting, none quite as favorable as mine, and all far inferior to that at the mouth of the fork. He reports the bed as going below drainage near the mouth of Rocky Point branch.

Fig. 300

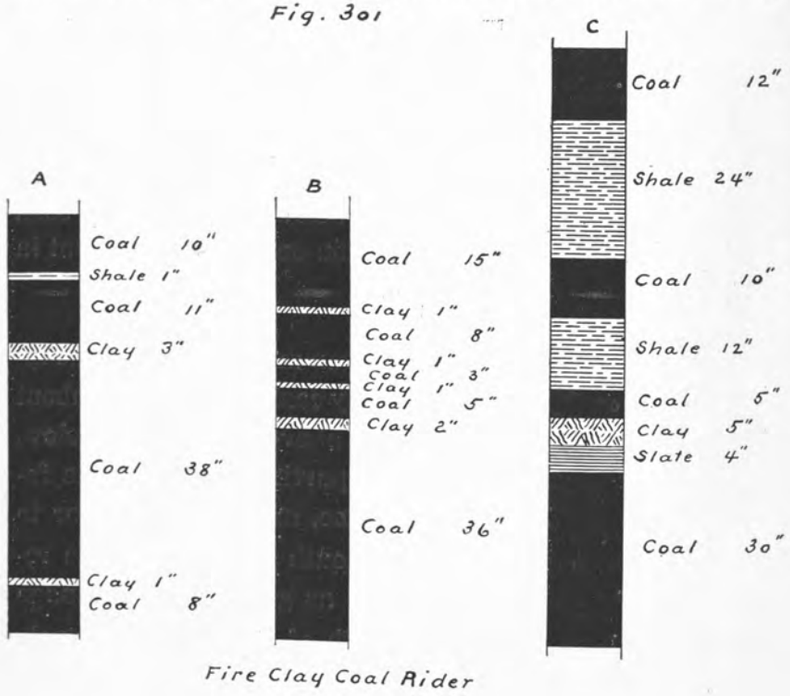


The rider to the Fire-clay coal was not discovered in my early examination, but was found at a recent opening as in figure 300 at Lucy (or James) Asher's, on the left, one-half mile up the fork. The bottom of the bed, in water, was not seen.

In A, B and C of figure 301 are Mr. Sullivan's measurements of the bed as opened, respectively, on the left and on the right, 1½ miles up "below the old Matilda Asher house," and at Mr. Roark's just above the mouth of Pups branch.

He gives the bed, also the following

Fig. 301



section, as found on a small branch on the west of the main creek, ⅛ mile below E. L. Morgan's house:

Cannel slate	4 in.
Coal	18 in.
Clay	1 in.
Coal	6 in.
Clay	½ in.
Coal	1 in.

It is not impossible that on pushing well underground the above partings would disappear, and higher benches of coal come in; nor does it appear likely that all the clay of the figured openings continues far underground.

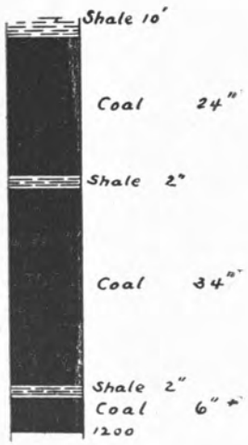
Mr. Sullivan's sample, from the opening "A," "slightly weathered and containing infiltered clay," gave the following results to Dr. R. Peter's analysis:

RIDER TO FIRE-CLAY COAL ("A")	Chem. Report No. 3185
Moisture	0.74
Volatile combustible matter	32.90
Fixed carbon	58.44
Ash (light gray)	7.92
	100.00
Sulphur	.892
Coke (spongy)	66.36

"Sample from the outcrop, taken from lower 44 in., with one thin clay parting."

As on Jack's creek, the fossil limestone was found about 170 feet above the Fire-clay coal, but here it is close above 14 in. of coal.

Fig. 303



D. Jackson

Fire Clay Coal Rider.

On the left, $\frac{1}{8}$ mile above Philips fork, the rider to the Fire-clay coal, figure 303, is opened, 235 feet, as recorded, above the creek. Actually it is probably considerably less, as the place of the bed at the mouth of Philips fork seems to be but 145 feet up, at elevation 1105, and there is little reason to suppose such rapid inclination of strata here, as such a difference in level would necessitate. Approximate measure of the bottom coal was due to water covering it.

Blue Hole Creek.—On the right, two miles above Philips fork.

Mr. Sullivan's page-map of this creek, accompanied by his vertical section on both sides of the map, is given in figure 304. Though no workable coal was found on the creek, the results are not without value.

Fig. 304

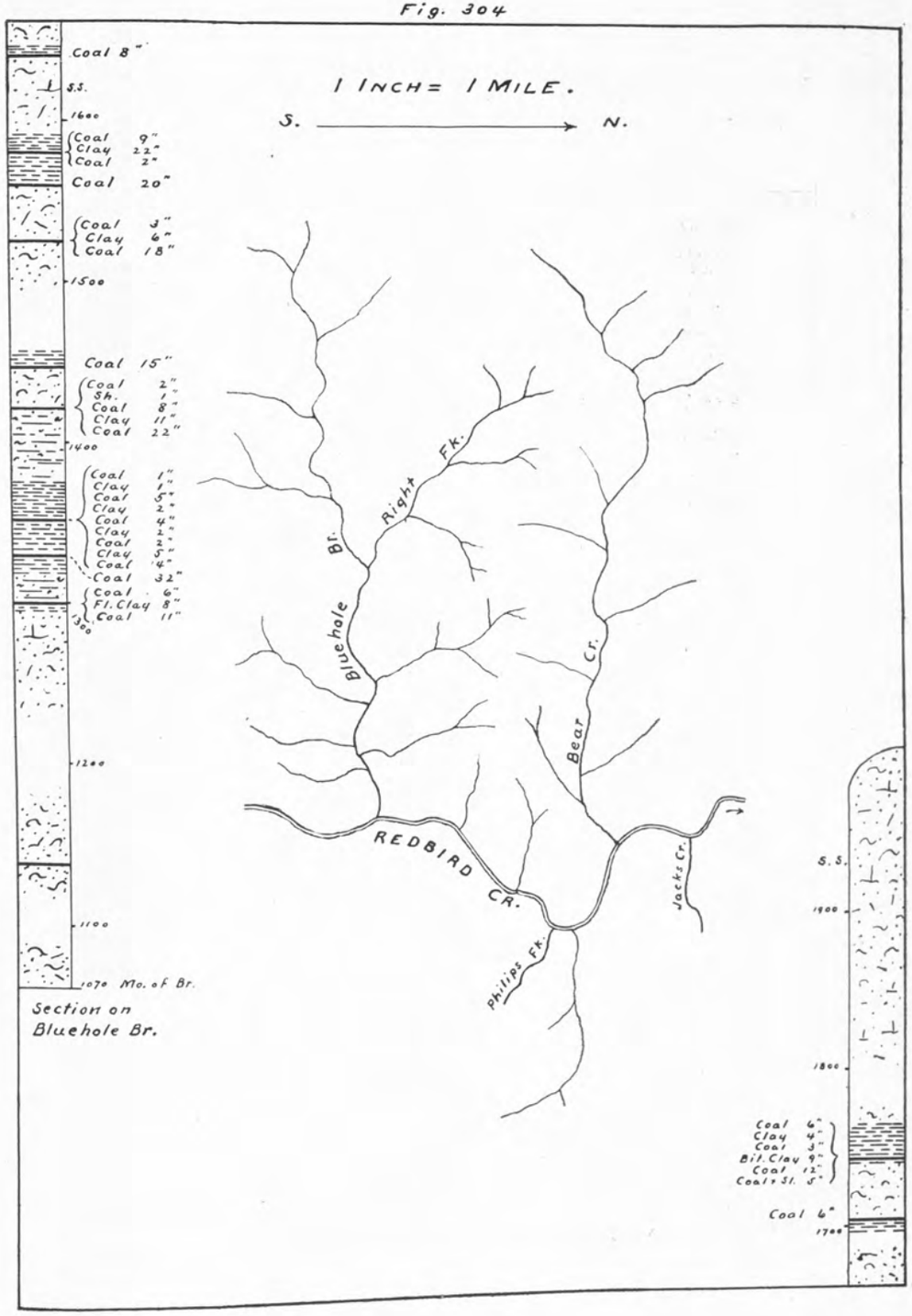
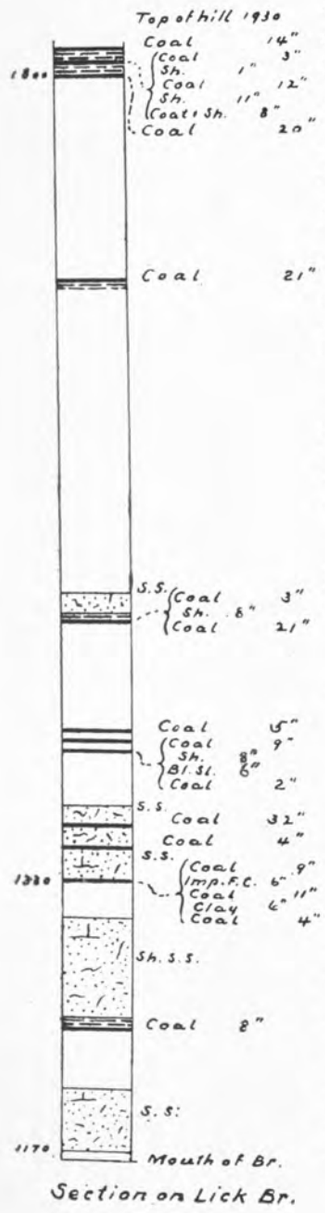


Fig. 305



Section on Lick Br.

The Fire-clay coal was opened 240 feet above the mouth of the creek, thin, as shown in the section; and the rider is but little better. Its bed-section, near the mouth of Bear Wallow, 1½ miles up, and analysis by Dr. R. Peter, from Mr. Sullivan's sample of the firm coal at that point, are given as follows:

RIDER TO FIRE-CLAY COAL.

Coal	5½ in.
Clay	½ in.
Coal	26½ in.

Chem. Report No. 3127

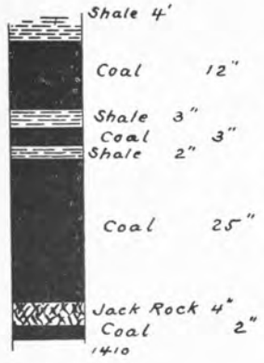
Moisture	1.20
Volatile combustible matter	29.80
Fixed carbon	65.00
Ash (light brownish gray)	4.00
	100.00
Sulphur	.755
Coke (dense)	69.00

The nine coals found above this bed were all thin, as shown in the section.

Lick Branch.—On the right, four miles above Philips fork.

The section taken on this creek, running from its mouth well up toward its head, is shown in figure 305, the Fire-clay coal at elevation 1330, having been opened a mile up this branch. A rise of strata, in general about with the creek, is noted in coming up Red Bird from Philips fork, but a westerly dip going up Lick branch reduced the intervals shown between coals in the section somewhat below what they actually are.

Fig. 306

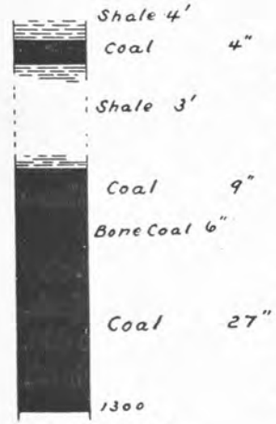


A. J. Asher
Fire Clay Coal

The Fire-clay coal as opened on the left, ½ mile up and 240 feet above the mouth of the branch, is shown in figure 306. The "jack rock" is a change from the pure flint clay which is not uncommon. This is the second place above Sugar creek where the bed has been found workable, and a mile up the branch it is thin again, as shown in the section, figure 305. The impure fire-clay parting there is, perhaps, a transition stage from the jack-rock just mentioned. The 80 feet apparent drop of the bed in the half mile between the two openings needs verification.

The 32 in. rider to the Fire-clay coal is of consequence only as it may lead to its discovery in better condition elsewhere. It is very much as on Blue Hole creek.

Fig. 307



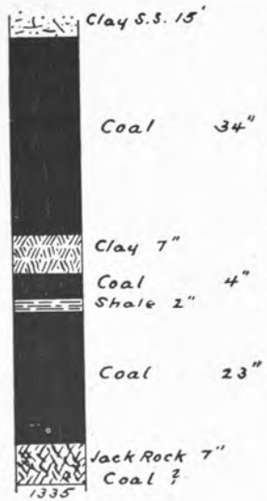
R. W. Asher
Fire Clay Coal

The three coals near the top of the section are of interest, as being, perhaps, of the Hindman bed, lost sight of above Sugar creek, coming back now towards a working condition.

Rich Branch.—On the left, 5¾ miles above Philips fork.

On the right, ⅛ mile up this branch, 70 feet above its mouth an opening into the Fire-clay coal gives the section of figure 307. If the opening had been started lower, it is likely that lower seams of the bed would have been uncovered.

Fig. 308



B. S. Knuckles
Fire Clay Coal

Meadow Fork.—On the right, six miles above Philips fork, (giving the road to Left fork, Straight creek).

On the left, ¾ mile up this fork, 30 feet above it, a 3-yard entry gives the Fire-clay coal as in figure 308, again with jack-rock parting, possibly with coal below it. The measurements obtained of coal and partings varied considerably, the entry having a very irregular roof.

By the path a half mile to the left of the gap to Left fork, Straight creek, 180 feet higher than it and 40 feet under the top of Kentucky ridge, is an old cannel coal opening showing several feet thickness; at elevation 2140, some 650 feet above the Fire-clay coal, it is probably either of the Hindman bed, or of one close to it.

Fig. 309

Geo. Knuckles
Fire Clay Coal

Cow Fork.—On the left, ½ mile above Meadow fork, 6½ miles above Philip's fork.

A 5-yard entry into the Fire-clay coal on the left, 15 feet above the fork, a mile up, gives the section of figure 309. The jack-rock parting serves to establish its correlation.

On the head of the main creek, on the left, ⅛ mile above Cow fork a 60-

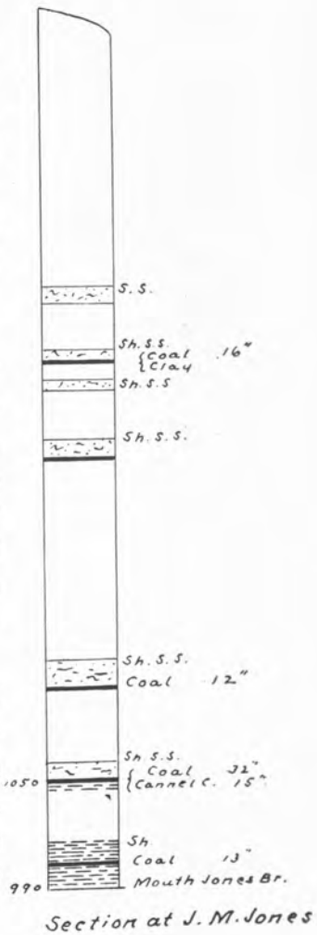
Fig. 310

J. B. Knuckles
Fire Clay Coal

yard entry with rooms gives coal of varying thickness in a considerable roll. On its slope the bed has been mined where over 6 feet thick, and elsewhere the top seam is down to 27 in. thickness. Figure 310 gives the section where it appears to be nearest normal. The bottom coal is not mined. The distinctive parting may be lower, but in any case, intermediate in direction and level between the Cow and Meadow forks coals and with a like roof, it is confidently assumed to be of the Fire-clay coal bed.

This bed, 100 feet higher on the head of Left fork, Straight creek, has the flint-clay parting in its floor. A cannel coal lies 30 feet above it there, and fossil limestones 180 and 420 feet above it. It is known widely on Cumberland river waters as the Dean coal.

Fig. 311



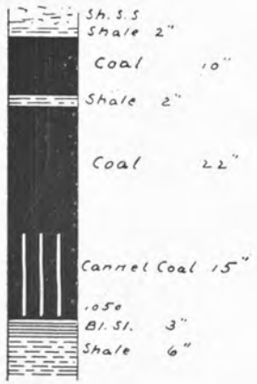
Section at J. M. Jones

GOOSE CREEK.

Beech Creek.—On this creek, near its mouth, the Manchester, or No. 1, coal has been opened with a thickness of about 3 feet.

The section of figure 311, taken about four miles up the creek, shows but one coal of workable thickness, correlated as No. 1a in my report of 1886. Its bed-section is given in figure 312, and analyses by Dr. R. Peter, of my samples of the cannel and of the 32 in. bituminous coal, are given below. Both are unduly high in ash because of included mud, but the cannel sample evidently included, also, black slate from the bottom of the bed, to which the good cannel changes by imperceptible degrees. If but 10 in. to 12 in. of cannel had been sampled, the result would have been but a fair percentage of ash, and perhaps a great diminution of sulphur.

Fig. 312

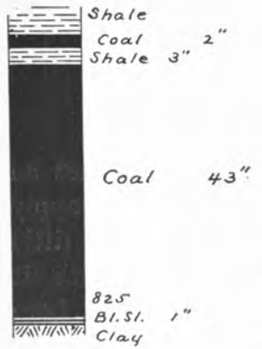


J. M. Jones

Chem. Report No.	2652 Cannel	2651 Bituminous
Moisture	0.42	0.92
Volatile com. matter	32.38	37.54
Fixed carbon	35.20	53.44
Ash	32.00	8.10
	100.00	100.00
Sulphur	6.042	1.601
Coke	dense	spongy
Specific gravity	-----	1.313
Color of ash	brown	light brownish gray

The Fire-clay coal is the only higher coal which gives any promise of being of value, and as that must lie well up towards the tops of the hills, and is thin on Hector creek, its promise is very slight.

Fig. 313



J. L. Hornsby
Manchester Coal

Laurel Creek.—Rising quite rapidly up this creek, the Manchester coal, a mile from the mouth, has the section of figure 313, one of its best in Clay county. My sample from this opening, taken from 3 yards underground, gave the following results to Dr. R. Peter's analysis:

MANCHESTER BED.	Chem. Report No. 2650
Moisture	1.46
Volatile combustible matter	34.84
Fixed carbon	57.70
Ash (nearly white)	6.00
	100.00
Sulphur	0.531
Coke (spongy)	63.70
Specific gravity	1.292

"Apparently a good splint coal. No apparent pyrites, but some ferruginous stains; seems to be a somewhat weathered sample."

A mile beyond the Hornsby opening the coal is but 30 inches thick, but farther up the creek it is said to be thicker again.

Manchester.—The Conglomerate formation which barely rises to river level at the mouth of Goose creek makes here the foundation for the town and rises to 100 feet above the

creek. Close above it is the Manchester coal, which has been opened in several places in the immediate vicinity, all abandoned for thicker coal at a greater distance.

Fig. 314

David Roberts
Manchester Coal

Horse Creek.—Numerous mines on this creek are worked for town supply in the Manchester bed, which is a little above creek level and rises with it for several miles. It is called here a 4-foot bed, but the coal is nowhere quite so thick, and rarely reaches 3½ feet. Figure 314, an opening a mile up the creek, reproduced from a former report, is believed to give a fair average thickness on this creek, where the bed is at its best in Clay county so far as yet found.

From Manchester the coal dips southward about 60 feet per mile to the Garrard mine at the former Salt works, on the right of the creek, 25 feet above it. The coal in this mine varies in thickness "from 12 in. to 42 in. with an average of 32 in.* By a later measure at 400 yards in, it had increased to 44 in. thickness. On the left of the creek, at the face of another Garrard mine, it measured 31 in. My sample from this point, 70 yards in, analysed by Dr. R. Peter, gave:

*C. J. Norwood, report of State Inspector of Mines.

MANCHESTER BED.	Chem. Report No. 2648
Moisture	1.20
Volatile combustible matter	38.10
Fixed carbon	54.90
Ash (lilac-gray)	5.80
	100.00
Sulphur	1.793
Coke (spongy)	60.70
Specific gravity	1.287

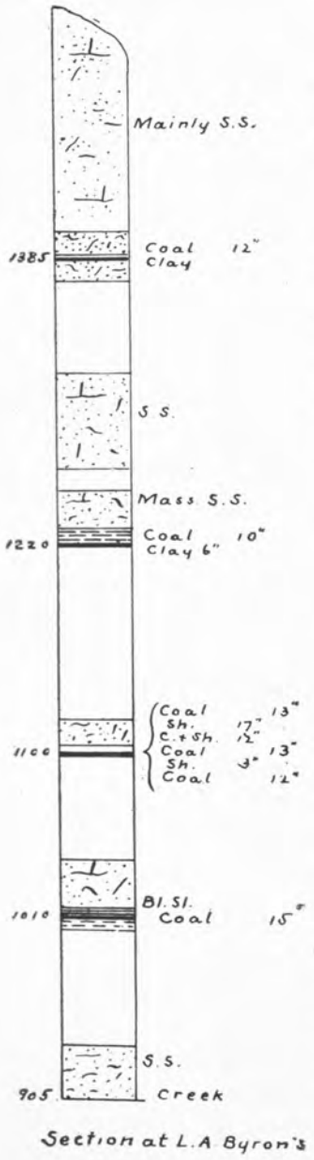
"A pure-looking pitch-black coal with very little fibrous coal and only a few specks of pyrites."

Collins Fork.—The southerly dip of strata from Manchester to the mouth of Collins fork, and again farther south, led to the belief that the dip was continuous, but by a late examination, needing verification, it appears that a short reversal of dip, or long roll, occurs just south of the Garrard mines, by which the Manchester coal is brought well above the bottom lands again. This will be assumed as the case in the following Goose creek details.

Buzzard Creek.—Two miles up on the left fork of Buzzard, Isaac Swafford had an entry into the Manchester bed, at elevation 1000, with coal 36 in. thick, but the entry is now abandoned (probably because of running down the dip) for one in which the coal is 31 in. thick at the mouth, and but 30 in. at the face, 20 yards in. Directly under this, as shown by an abandoned opening by the roadside, is:

Shale	3 ft.
Coal and shale	9 in.
Coal	16 in.

Fig. 315



Section at L.A Byron's

corresponding with exposures on Otter creek, where the upper seam is wanting.

A reported thick cannel coal opening, fallen in, far up the right fork of Buzzard, is likely to prove of the Fire-clay coal rider.

At James Adams', 1¼ miles up Collins fork, ¼ mile up a left branch, an old opening into the Manchester bed gave:

		Elevation.
Shale	5 ft.	----
Coal	9 in.	----
Shale	6 in.	----
Coal	24 in.	960

Showing a very slight westward dip from Swafford's on Buzzard creek.

Aery Branch.—On the right, 1½ miles above Buzzard creek.

A 9 in. splint coal under 21 in. black slate, found ½ mile up the branch, at elevation 1045, is of the No. 2 Coal, and of value only for tracing the beds.

Ingram Branch.—On the left, two miles above Buzzard creek.

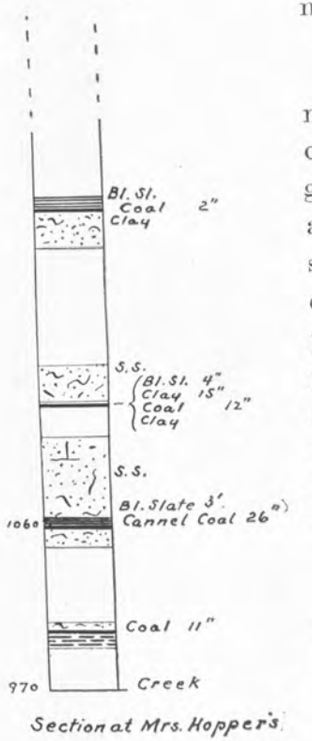
The section, figure 315, was taken from the mouth to two miles up the branch.

The lowest coal shown, found also on Aery branch, indicates a southerly dip again, but not enough to carry the Manchester coal below drainage. It probably lies directly on the sandstone at the bottom of the section.

The coal at elevation 1100 is, in its position and condition, at least a reminder of the Elkhorn coal, but much more development is necessary before it can be correlated with any degree of confidence.

The upper coal of the section is nearly on the horizon of the Fire-clay coal. It is believed that coal should be found here to correspond with the cannel reported on Buzzard creek.

Fig. 316



Section at Mrs. Hopper's

Figure 316 shows a section as taken near the mouth of Bull creek, below and opposite Hammond's fork. From Ingram branch the strata appear to rise about with the creek, so the 26 in. very slaty cannel, somewhat inclined to splint coal and with black slate roof, is probably the bottom coal of the next preceding section. (The No. 2 of my former report.) This 26 in. coal was found ¼ mile up Bull creek. At T. Jones', two miles up the creek, the same bed has the following section:

		Elevation.
Shale	3 ft.	----
Splinty cannel	15 in.	----
Bituminous coal	1 to 4 in.	----
Lime concretions	3 to 0 in.	----
Bituminous coal	7 in.	1100

The Manchester coal should then be close below the creek level, and the Fire-clay coal rider, the Stinking creek cannel coal, well up toward the top of the hill.

At Mrs. S. A. White's mine, on the main or left fork of Goose creek, five miles above Manchester, is the coal of figure 317, now correlated with the Manchester bed. Analysis by Dr. R. Peter of my sample, omitting the bottom 4 inches, from seven yards underground, is given below:

Fig. 317

Mrs. S. A White
Manchester Coal

MANCHESTER BED.	Chem. Report No. 2649
Moisture	1.48
Volatile combustible matter	35.92
Fixed carbon	54.70
Ash (light lilac gray)	7.90
	100.00
Sulphur	0.885
Coke (spongy)	62.60
Specific gravity	1.278

"Resembles the preceding. (The Garrard coal.) No pyrites apparent."

The bed shows itself conspicuously at several points along the road up to Martin's creek. At Elhannon Wilson's entry, by the road ½ mile below that creek, it has the following section:

		Elevation.
Shale	8 ft.	----
Coal	2 in.	----
Shale	1 in.	----
Coal	2 in.	----
Shale	1 in.	----
Coal	16 in.	----
Shale	10 in.	----
Coal	15 in.	1020

Martin's Creek.—By the road, ¾ mile up this creek, the Manchester bed shows the following:

Fig. 318

J. B. Walker

		Elevation.
Shale	8 ft.	----
Coal	23 in.	----
Shale	1½ ft.	----
Coal	2 in.	1610

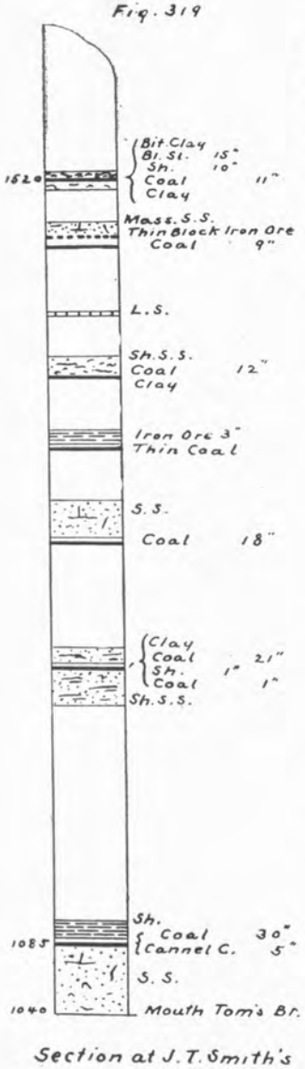
with possibly more seams of coal below. At J. B. Walker's two miles up, the bed lying nearly horizontal, is probably about at creek level.

Mr. Walker has an entry into the Fire-clay coal rider, as it appears, which is represented, in figure 318, as measured at the mouth. At the face, 60 yards in, the bottom coals are reduced from 18 in. to 15 in. and the parting next above them is increased to 24 in. The cannel is fine-looking, of light weight and without division plane between it and the coal on it.

The opening is close to the hill-top, and, perhaps, drains into Timber-tree creek, but it is reached by road from Martin's creek.

Otter Creek.—The Manchester bed is opened in an entry at the mouth of this creek, 30 feet above it, and also at frequent intervals along the creek until it goes below drainage. Sections are here given taken at the mouth and at an entry a mile up the creek, five feet above it.

Fig. 319



Section at J. T. Smith's

AT MOUTH.

Shale	8 ft.
Coal and shale	9 in.
Coal	16 in.
Shale	8 in.
Coal	2 in.
Under-clay.	
Sandstone cliff.	

ONE MILE UP.

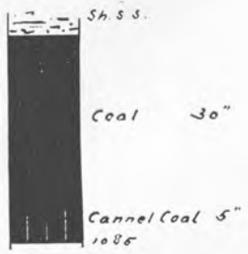
Laminated sandstone	15 ft.
Shale and coal	7 in.
Coal	22 in.

The laminated sandstone shows a tendency to honeycomb. The bed rises about 20 feet in the mile.

Tom's Branch.—On the right, three miles above Otter creek.

The Manchester coal, having passed below drainage about half way up from Otter Creek is some 40 feet under at the mouth of Tom's branch.

Fig. 320



J. T. Smith.

The cannel coal bed near the bottom of the section, figure 319 shown enlarged in figure 320, is therefore 85 feet more or less, above the Manchester coal. This bed carries cannel also on Beech creek (below Manchester) and on Bull creek, at the head of Collins fork. My sample of the 30

in. bituminous and of a specimen of the cannel coal, from Mr. Smith's entry, taken from five yards underground, yielded, on analysis by Dr. R. Peter:

COAL No. 2.	Chem. No. 2653. Bituminous.	Report No. 2655. Cannel.
Moisture	2.80	0.30
Volatile combustible matter	29.40	44.16
Fixed carbon	57.00	43.74
Ash	10.80	11.80
	100.00	100.00
Sulphur	1.178	1.244
Coke	dense friable	dense
Color of ash	light brown	dark gray
Specific gravity	-------	1.160

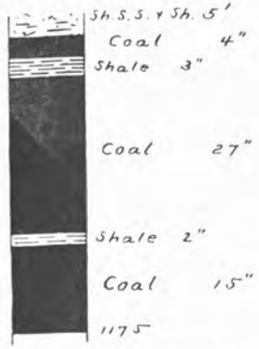
Compared with the bottom coal of figure 315, Ingram's branch, a very slight northwesterly dip is evidenced, so slight that the line of strike is probably about northwest.

It appears that the Fire-clay coal and its rider are near the levels of the two top coals of the section, but nothing was found by which to identify them.

Woodson Mills has an opening opposite the mouth of Asher fork, 135 feet above it, in which the following measurements were taken:

		Elevation.
Shale	5 ft.	----
Coal	1 in.	----
Shale	5 in.	----
Coal	1 in.	----
Shale	1 in.	----
Coal	4 in.	----
Shale	2 in.	----
Coal	18 in.	----
Black slate	3 in.	----
Coal	4 in.†	1185

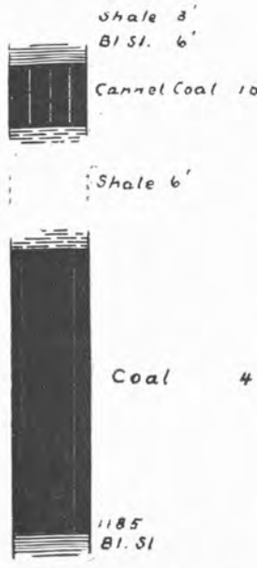
Fig. 321



The Tom's branch cannel (No. 2 Coal) is at or slightly below the creek level, and the opening is, therefore, near the level of the Elkhorn bed, and probably represents it.

On the left 1½ miles above Asher fork, at the Jackson mill, an old opening, 85 feet above the creek gave the bed-section of figure 321. With much doubt as to correlation it is assigned to the Fire-clay coal bed.

Fig. 322

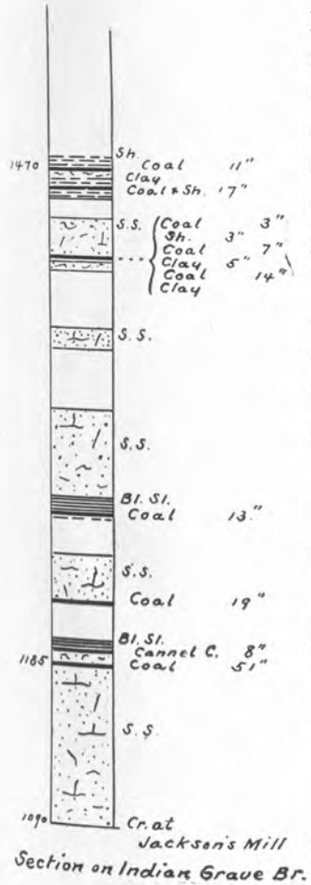


Hun Jackson Branch.—On the right 1¾ miles above Asher fork.

An eighth mile up this branch the same bed is opened as shown in figure 322. It is difficult to believe that this does not give the Fire-clay bed and its rider, the latter as cannel coal, as often found and especially conspicuous as such across Kentucky ridge on Stinking creek; and no coal below it in the Kentucky river region is known to have such a section. Moreover, considering this as the Fire-clay coal, an unusual similarity is apparent between the section of

figure 323, in which this coal is shown, and that of the Blue-hole creek section, figure 304, taken a few miles east from the former.

Fig. 323



The Jackson opening is lower in the ridge than was to be expected of the Fire-clay coal; it is apparently over 100 feet lower than the latter on Blue-hole creek, directly east, and on Stinking creek directly west, but half of that difference may be due to error in ascertaining its level. Nothing was seen in going up Goose creek from Asher fork to indicate such a dip as would bring the Fire-clay coal bed to the level of the Jackson opening. Notwithstanding all this the preponderance of evidence is in favor of the proposed correlation.

Analysis of my sample of the 51 in. bituminous coal, by Dr. R. Peter, yielded:

FIRE-CLAY COAL (?)	Chem. Report No. 2647
Moisture	1.10
Volatile combustible matter	35.60
Fixed carbon	56.90
Ash (light brownish-gray)	6.40
	100.00
Sulphur	0.885
Coke (light spongy)	63.30
Specific gravity	1.288

"A pure-looking coal. No apparent pyrites and but little fibrous coal. Ferruginous stains on some of the pieces."

The section of figure 323 shows only the lower coals found

along Indian Grave branch in a distance of two miles. While there are no thick coals above the Fire-clay coal known on this creek, or toward the head of Red Bird, the high Kentucky ridge and spurs from it about the heads of these creeks still offer a fair field for search of them, with reasonable prospect of finding workable beds.